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Tree Management Specification

1

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PART 1: Tree Protection

1.1 Tree removal and retention

The retention and/or removal of existing trees shall be determined in consultation with Randwick City Council. Decisions about tree removal and retention shall be based on a combination of proper arboricultural assessment and appropriate high quality design outcomes.

Relevant demolition and construction plans shall clearly indicate existing trees to be removed and existing trees to be retained and protected.

All trees marked to be retained shall be protected in accordance with Australian Standard AS 4970 – 2009 - Protection of Trees on Development Sites.

1.2 Tree protection plan

A Tree Protection Plan shall be produced in order to specify the measures that will be taken to ensure the ongoing health and stability of the trees. It will also specify the ongoing monitoring regime and the implementation of all tree protection measures.

As a minimum requirement the Plan shall comply with the measures set out in Appendix G of the Randwick City Council Tree Management Technical Manual and shall be submitted to Council's Tree Management section for review and comment prior to being approved for use.

1.3 Project Arborist

A Project arborist shall be engaged by TfNSW to prepare the Tree Protection Plan. The Project arborist shall be qualified in arboriculture to Australian Qualifications Framework (AQF) level 5 or above, and have at least five (5) years demonstrated experience in managing trees within complex development sites.

The responsibilities and duties of the Project arborist shall include (but not be limited to) the following:

- (a) Prepare a plan (or set of plans) showing the location of existing trees to be retained and the position of all recommended tree protection devices or other tree protection works;
- (b) Include an assessment and discussion of the likely impacts the proposed works will have on the trees. This should include above and below ground constraints on trees that should be retained;
- (c) Recommend any design modifications, construction techniques and/or other protection measures required to minimise adverse impact on trees that should be retained during the demolition and construction works and into the long term;
- (d) Prepare a Specification for tree protection measures suitable for use in the consent conditions and Tender documentation. The Specification should include detailed drawings where required. Marked up digital photos should be used to specify tree pruning works where needed. All tree pruning must be in accordance with Australian Standard AS 4373 – 2007 - Pruning of Amenity Trees;
- (e) Detail site specific tree protection measures for each tree in accordance with AS 4970 – 2009

- (f) Undertake an inspection of the site prior to the commencement of works in any given area, and review the tree impact assessment and specified tree protection measures;
- (g) Meet with TfNSW nominated personnel to discuss tree protection measures prior to works commencing on any given site;
- (h) Inspect and confirm the correct installation of the specified tree protection measures, prior to the commencement of any excavation or demolition;
- (i) In the event that tree protection measures have not been previously specified, detail site specific tree protections measures for each tree in accordance with AS 4970 – 2009 - Protection of Trees on Development Sites, and oversee their installation and/or implementation on site as required;
- (j) Undertake monitoring of the works during the construction phase to ensure trees are adequately protected in accordance with the Tree Protection Plan;
- (k) Liaise with TfNSW nominated personnel as required throughout the project and provide specialised arboricultural advice, such as the extent of root pruning or alternative construction methods, to minimise or avoid any adverse impact on trees;
- (l) Inspect and supervise any works (including canopy pruning) within the Tree Protection Zones of the trees nominated to be protected. Provide advice where required to minimize root disturbance or damage;
- (m) Undertake inspection of trees to be supplied for planting (on site or at nursery) and provide advice regarding their conformance to NATSPEC and/or the contract documentation; and
- (n) Undertake final inspection at completion of the works, including landscape works, to provide written certification (including photographic evidence) that the work has been completed in accordance with the Tree Protection Plan.

PART 2: Tree Pit Design

2.1 General requirements

The aim of the following performance based Specification is to set the parameters to guide the design and construction of nominated street tree planter pits within the project area.

Trees are a major component of the landscape and the long term success of a streetscape is often judged on the success of the trees planted within it. The locations of new and replacement trees within the streetscape must be selected after thorough review and consideration of the size of the tree at maturity and possible conflicts with, and restrictions imposed, by above and below ground infrastructure.

2.2 Soil Volume

Adequate volumes of soil of a suitable quality are required to ensure successful tree establishment and growth to maturity.

The minimum volume of soil available to support the growth of each 400 litre tree shall be not less than 30 cubic metres. The following points shall be considered in the calculation of available soil volumes:

- (a) The space occupied by rock or other structural pavement supports shall be excluded from the soil volume calculation;
- (b) Existing site soil shall be included in soil volume calculations only if it can be demonstrated that the soil has acceptable physical and chemical qualities to sustain long term tree growth and tree roots have unrestricted access to it; and
- (c) The alignment of service trenches, the space they occupy, and their possible restriction of natural root spread and development shall be considered in the calculation of available soil volumes.

2.3 Pavement support

There are various methods or systems available for providing uncompacted soil suitable for tree growth beneath load bearing pavements. Examples include vaulted systems, structural soil (either premixed or mixed in situ), continuous soil trenches, and proprietary load bearing cells and matrixes. Each has their advantages and disadvantages.

A suitable system or model tree pit design shall be developed based on existing site constraints and the need to provide adequate soil volumes. The tree pit design shall be made available for review by Randwick City Council.

Consideration shall be given to the need for gaseous exchange and aeration of the tree pit soil, as well as future access for the provision of soil treatments or amendments if necessary.

2.4 Soil type

Advice shall be sought from a suitably qualified and experienced consultant who specialises in the Specification and management of urban soils. The consultant shall provide the following services to the project:

- (a) Provide analysis and assessment of existing site soils when required;
- (b) Review and critique the preferred tree pit design and offer any recommendations considered necessary to rectify foreseeable problems or to enhance its function;
- (c) Specify the soils to be used within the tree pit design in terms of their performance and physical and chemical qualities; and
- (d) Make recommendations as to the necessary testing of supplied soils to ensure the specified soils are of an acceptable quality.

2.5 Root development

The tree pit design shall allow for the natural growth and development of the trees' structural root system to ensure their long term structural stability.

Root barriers shall only be used when absolutely necessary to protect below ground services at risk of damage. In this regard, root barriers shall only be used to surround and protect individual services within the root zone, rather than inhibiting root spread in any given direction.

2.6 Drainage

Tree pits shall be designed to allow free and natural drainage wherever existing site soil conditions allow. Additional subsoil drainage and connections to existing stormwater infrastructure shall be provided when necessary, and at the advice of the urban soil consultant.

2.7 Irrigation and water sensitive urban design

The trees will require irrigation to ensure proper establishment. The irrigation may be automatically or manually delivered. The tree pit design shall accommodate the preferred method of irrigation.

The potential for harvesting surface stormwater and diverting it into the tree pits shall be assessed and incorporated into the design whenever feasible.

2.8 Tree grates and guards

The tree grates and guards shall be in accordance with Randwick City Council's Codes and Standards, as part of a designed suite of furniture. The tree grates and guards shall be integrated into the tree pit design.

PART 3: Tree Supply

3.1 Species

The various tree species required for street tree planting along the route of the light rail project shall be nominated by Randwick City Council.

3.2 Size

The size of trees at the time of planting into the finished landscape shall be a 400 litre container size with a height of between 4.5-6m metres and a spread of 3-4 metres. Adequate lead time for forward ordering the trees must be allowed to guarantee the supply of trees of an acceptable size and quality.

3.3 General conditions and quality

All trees supplied to the project shall conform to the NATSPEC guide and 'Guide for assessing the quality of and purchasing of landscape trees' by Ross Clark 2003.

Nursery stock shall meet design criteria for minimum dimensions, container size and shape, plant shape or special pruning requirements outlined in this document and the table below.

Definitions for the terms used within this Specification shall be in accordance with the NATSPEC guide.

Litre	Caliper	Height	Spread
200	60-70mm	3.5-4.5m	1.5-3m
400	80-90mm	4.5-6m	3-4m

3.4 Labeling of stock

Clearly label individual trees and batches with the species name and cultivar variety. The label is to withstand transit without erasure or misplacement.

3.5 True to type

The trees supplied and planted shall be the species, and variety or cultivar that Randwick City Council has specified.

3.6 Health and vigor

The trees supplied shall be healthy and vigorous at the time of delivery and planting. Supply trees with foliage size, texture and colour at the time of delivery consistent with the size, texture and colour shown in healthy specimens of the nominated species. Supply trees with extension growth consistent with that exhibited by vigorous specimens of the nominated species.

3.7 Pests and diseases

Trees shall not be diseased or show evidence of pest attack that could affect the long term health of the tree or adjoining plantings. Supply trees with foliage and soil free from attack by pests and diseases.

3.8 Injury

Supply only trees free from injury and wounds.

3.9 Self supporting

Supply only trees that are self supporting.

3.10 Stem taper

Supply trees where the caliper at any given point on the stem is greater than the caliper at any point higher on the stem.

3.11 Pruning

Trees are not to be pruned into a saleable shape just prior to shipment. All pruning shall be a clean cut at the branch collar, no lopping or topping of trees is to be carried out and the diameter of any wound must not exceed 50% of the caliper immediately above the point of pruning.

Clean stem height: trees shall be supplied with a clean stem height of 35-40% of total tree height. For example a 5m tall tree is to be pruned to 2m maximum (clean stem height must not exceed 40% of total tree height).

Pruning wounds: Restrict fresh cuts (ie, recent, non-calloused) to <20% of total tree height.

Type: Ensure a clean cut at the branch collar that complies with AS 4373 – 2007 - Pruning of Amenity Trees.

3.12 Crown symmetry

The symmetry of the crown is an important aspect of the presentation and appearance of the tree in the landscape. Difference in crown distribution on opposite sides of the stem axis must not exceed 20%.

3.13 Stem structure

Species with an excurrent form: Supply trees with a defined central leader and the apical bud intact. Trees that have had their leaders cut or damaged will not be accepted. Supply trees with a single stem roughly in the centre of the tree with any deviation from vertical being <15°.

Species with decurrent form: Supply trees where the central stem is not divided at any point lower than the clean stem height nominated, and that the stem junction at the point of division is sound.

All species: Ensure that branch diameter is less than or equal to one-half of the caliper immediately above the branch junction.

3.14 Included bark

Supply trees where the branch/stem bark ridges at junctions between stems and branches and between co-dominate stems are convex.

3.15 Trunk position

Supply trees with the distance from the centre of the trunk to any extremity of the rootball not varying by >10%.

3.16 Compatibility of graft unions

When purchasing named cultivars propagated by grafting, it is critical that the graft union is sound and that the scion and rootstock are compatible. The union between the scion and the rootstock must be sound for the entire perimeter of the graft. The diameter of the scion immediately above the graft must be equal to the diameter of the rootstock immediately below the graft (+/-20%).

3.17 Indication of North

Indicate the northerly aspect during growth in the nursery and ensure it is marked on the container so as to withstand transit without erasure or misplacement.

3.18 Root division

Trees in containers >45 litre: Primary division of roots is to have occurred within the outer 50% of the rootball at <100mm intervals.

3.19 Root direction

Ensure that roots, from the point of initiation, generally grow in outwards (radial) or downwards direction, and that any deviation from the established direction is <45°.

3.20 Root ball occupancy

Soil Retention: On shaking or handling of the unsupported rootball at least 90% of the soil volume shall remain intact.

3.21 Height of root crown

Ensure that the tree's root crown is at the surface of the rootball and free from suckering.

3.22 Non-suckering rootstock

Grafted cultivars/varieties: Supply trees grafted onto non-suckering rootstock.

3.23 Rejection of non-conforming specimens

Any tree not conforming to the Specifications and standards listed in this Specification shall be rejected and suitable replacements provided. If non-conforming trees are provided, Randwick City Council may require new stock that complies to be supplied and planted.

PART 4: Tree Planting

4.1 General

This Specification describes the appropriate techniques to be used to install new street trees within newly constructed tree pits or nominated planting sites. Tree pits shall be designed and constructed in accordance with the requirements of Part 2 Tree Pit Design.

There may be allowance for some variation in the techniques to be used. However, any change to the techniques from those described here must be submitted in a Work Method Statement for approval by the Project arborist.

Tree planting works shall be undertaken by an arborist or horticulturist with minimum certification in accordance with Australian Qualifications Framework (AQF) Level 3, and certified as complete to an acceptable standard by the Project arborist.

4.2 Statutory requirements

TfNSW is responsible for compliance with all relevant statutory requirements.

TfNSW shall be able to demonstrate clear working programs and sequences. Site specific pedestrian and vehicular traffic control plans are to be implemented where necessary and shall conform to NSW Roads and Maritime Services guidelines and any other statutory requirements. These plans shall include any requirements for parking of worksite vehicles and the delivery of materials.

Approval from the NSW Police Service and the NSW Roads and Maritime Services may be required when the work has an impact on traffic flow.

4.3 Environmental controls

TfNSW shall ensure that all materials and the execution of the work are ecologically sound, environmentally benign and consistent with the principles of sustainable development.

TfNSW shall take all practical precautions to ensure that dust and noise caused by the works are kept to a minimum. The installer shall be responsible for all localised sediment and erosion control of work and stockpiles under their control and use.

TfNSW must comply, and make sure that sub-contractors comply, with the general provisions of this clause and any other environmental protection provisions within the requirements of any statute, by-law, standard and the like related to environmental protection.

4.4 Site investigations, existing services and structures

In accordance with NSW electricity and gas supply regulations, all excavations for tree planting require the review of underground service plans sourced from Dial Before You Dig service. Specialist service location tools or expertise may be required when underground service plans are insufficiently detailed or where plans indicate that services are close to the intended planting location. TfNSW shall be responsible for the rectification of all pavement surfaces where inspections have been undertaken including the making good of any excavation or site markings. TfNSW shall notify Randwick City Council immediately upon discovery of services or obstructions that prevent any planned tree planting. All services shall be considered live until determined otherwise.

In the event of any damage to any service, TfNSW shall as soon as practicable notify the relevant authority and Randwick City Council and satisfy all requirements of the authority concerned.

TfNSW shall be liable for all damage caused by the tree installation works to all existing buildings and structures. TfNSW shall make good all damage caused by its activities at its expense.

4.5 Planting conditions

Do not plant in unsuitable weather conditions such as extreme heat, cold wind or rain. Avoid planting where unseasonable and adverse weather is forecast within 24 hours of the operations. No trees are to be planted on days exceeding temperatures of 30o Celsius. Generally, tree planting is preferred during the cooler months from March to October.

4.6 Watering

Thoroughly water the tree rootballs before planting and then immediately after planting. Prevent the rootballs from drying out during the planting phase.

Apply water so as not to disturb the soil. Raise the moisture within the root zone to field capacity. Ensure potted rootball is thoroughly wet through the entire soil profile. Continue watering at a rate and frequency as required to avoid water stress in the plant.

4.7 Lifting of trees

It is preferred that all trees are carried or slung via the rootball. In the event that the trees have to be repositioned or lifted by the trunk, the installer shall provide adequate soft padding to the trunk in the form of underfelt, carpet or rubber wrapping and use only soft slings during the lifting.

4.8 Placement

When the tree pit is excavated and the hole is the correct size, place the root ball in its final position. Ensure the trees are centred and plumb and the top of the rootball is level with the finished surface of the surrounding soil mix.

Do not use the trunk of the tree as a lever in positioning or moving the tree in the planting hole.

4.9 Alignment and orientation

Position the tree at the setout distances as nominated by Randwick City Council. Ensure trunks are set vertically and aligned with other new or existing trees.

Orientate the tree's trunk North where indicated by supplied markings where applicable (+/- 20o). Adjust within the above tolerances so that the primary lowest branches are generally aligned parallel with the kerb and footways (NOT extending into footways).

4.10 Formative pruning

The Project arborist shall assess the planted trees for any remedial pruning required to correct minor structural defects or damage. Any pruning specified shall be performed by an Arborist with minimum certification in accordance with Australian Qualifications Framework (AQF) Level 3 and in accordance with Australian Standard AS 4373 – 2007 - Pruning of Amenity Trees.

4.11 Root trimming

Determine if final stage root pruning has occurred at the supply nursery prior to delivery. If root pruning has not already occurred, all trees shall have the outer 10-25mm of the external rootball faces pruned or sliced away using secateurs or a sharp and clean spade. Avoid excessive disturbance to the remaining rootball during this trimming and discontinue if excessive rootball soil begins to fall away. Do not leave the rootballs exposed for extended periods. Cover the rootball with moist hessian if backfilling cannot occur immediately.

4.12 Backfilling

Backfill with soil mix as specified in the approved tree pit design detail and in accordance with other relevant details and Specifications. Lightly compact the soil to ensure all voids around rootballs are filled and that no air pockets are retained.

Ensure that the backfill soil is not paced over the top of the potted rootball. The top of the rootball and plant stem must be kept level with the top of the backfill.

4.13 Mulch

Any mulch specified in the tree pit design detail shall be free of deleterious and extraneous matter, including soil, weeds, rocks, twigs and the like. Lay mulch to nominal 80mm depth. Place the mulch so that it is not in direct contact with the trunk. Dish mulch away from trunk at base of root ball.

4.14 Terrabonding/Rubber Mulch

Terrabond and/or recycled rubber mulch are to be utilised at sites nominated by Randwick City Council and are to be of a size and Specification specified by Council.

PART 5: Tree Establishment and Maintenance

5.1 Tree establishment period

The tree establishment period commences at the date of practical completion and continues for a period of 24 months.

All trees shall also be maintained immediately following their installation, as per the Specifications below, up until the above tree establishment period expires. Tree maintenance works shall be undertaken by an Arborist or Horticulturist with minimum certification in accordance with Australian Qualifications Framework (AQF) Level 3.

5.2 Tree establishment program

The service provider shall submit a program prior to the commencement of the tree establishment period. The program shall detail all works required during the planting/establishment period including:

- (a) rectification of defects;
- (b) provision of materials;
- (c) watering;
- (d) fertilising;
- (e) control of weed growth; and
- (f) replacement of dead, damaged or stolen plants.

5.3 Maintenance

Throughout the tree establishment period, the installer must continue to maintain new trees and carry out maintenance work including, but not limited to:

- (a) weeding and rubbish removal from tree pits and grates;
- (b) fertilising;
- (c) pest and disease control; (d) replanting;
- (e) adjustment, removal or replacement of tree guards or grates;
- (f) formative and selective pruning to AS 4373 – 2007 - Pruning of Amenity Trees; and
- (g) mulching to maintain and reinstate to depth specified;
- (h) replacement of terrabond or rubber mulch as required.

Watering and/or monitoring of an irrigation system shall be incorporated into the regular maintenance schedule, with the soil moisture content of the tree pits to be maintained at a level to support optimal tree establishment and growth. The installer will allow for a minimum of 2 maintenance visits per week.

Inspection results and the maintenance procedures shall be recorded and submitted to Randwick City Council every two months. The various ongoing maintenance practices shall be carried out to the satisfaction of Randwick City Council.

5.4 Tree replacement notification

TfNSW shall provide 7 days' notice to Randwick City Council of any works to replace trees as part of the planting establishment program.

5.5 Fertilising

Tree pit soil shall be fertilised to address any nutrient deficiencies of the existing site soil and/or imported soil mixes, and to promote vigorous growth and rapid establishment. A program shall be developed with reference to the soil Specification and recommendations contained within Part 2 Tree Pit Design.

Fertilisers should typically be coated slow release landscape fertilisers suitable for trees and shrubs (Terraform, Osmocote or approved equivalent). The fertiliser should be incorporated into upper 100mm of the soil profile at rates recommended by the manufacturer, and reapplied when necessary to maintain adequate nutrient levels available for plant use.

5.6 Tree replacements

Where trees are:

- (a) damaged by TfNSW; or
- (b) die or fail to maintain vigorous growth typical of the species due to neglect or inadequate maintenance by TfNSW prior to or during the tree establishment period, TfNSW shall replace, replant and maintain trees of the same species, size and quality.

For clarity, TfNSW is not required to replace trees which are damaged or destroyed by third parties, including by vandalism, after planting.

PART 6: Tree Offsets

6.1 Tree Removal

Where established public tree assets have to be removed to facilitate construction of the light rail their removal shall be offset by TfNSW replacing them with trees as detailed below:

- Removal of a large tree (DBH greater than 60cm):
Offset to plant minimum of 8 trees
- Removal of a medium tree (DBH greater than 15cm but less than 60cm):
Offset to plant minimum of 4 trees
- Removal of a small young tree (DBH less than 15cm):
Offset to plant minimum 2 trees

6.2 Offset locations

The location of offset trees is to be within the immediate proximity of the tree(s) being removed, or if that is not practicable, then an alternate location will be specified by Randwick City Council that provides the maximum public domain/streetscape benefit.

Urban Elements

2

PARK SEAT

SE05



Source: www.townandpark.com.au

This Town & Park suite of furniture has been selected for its non intrusive design, along with its durability and functional qualities.

The Park Seat is for use in areas where long term sitting is required at transport connections and resting points within parks and residential areas. The Park Seat provides a better amenity for the mobile impaired users, over the bench option. Timber or aluminium battens can be selected to ensure longevity of the urban element in high vandal areas.

INDICATIVE COST

SSE/T: \$1199.00+GST, supply only

SSE/A: \$1130.00+GST, supply only

MATERIALS AND FINISHES

Frame:

- Diecast aluminium (Alloy AC 401)
- Sandcast aluminium (Alloy AA 601)
- Stainless steel fixings

Battens:

- Extruded aluminium (Alloy AC 6101 T6)
- Grade 1 hardwood ecotimber

MAINTENANCE

Regular water blasting or washing down of the metalwork is required for general city cleanliness.

A six monthly cleaning schedule is recommended in coastal environments to prevent salt and sand build-up. Oiling of the timber battens is recommended six months after installation, followed by yearly applications.

Remove and replace seat if bent or damaged.

RECOMMENDED LOCATIONS

Civic Parks
Pocket Parks
Neighbourhood Parks
District Parks
Sports Parks
Waterfront Parks



Source: Dickson Rothschild

SUPPLIER

Town & Park Furniture,
14/28 Roseberry Street
Balgowlah NSW 2093

Tel: 02 9907 6411

Fax: 02 9907 6422

PRODUCT CODES

SSE/T/SS

- 'City' Seat
- Aluminium frame
- Timber battens
- Sub-surface fixing
- Optional armrest

SSE/A/SS

- 'City' Seat
- Aluminium frame
- Aluminium battens
- Sub-surface fixing
- Optional armrest

SE05

TYPICAL PLACEMENT

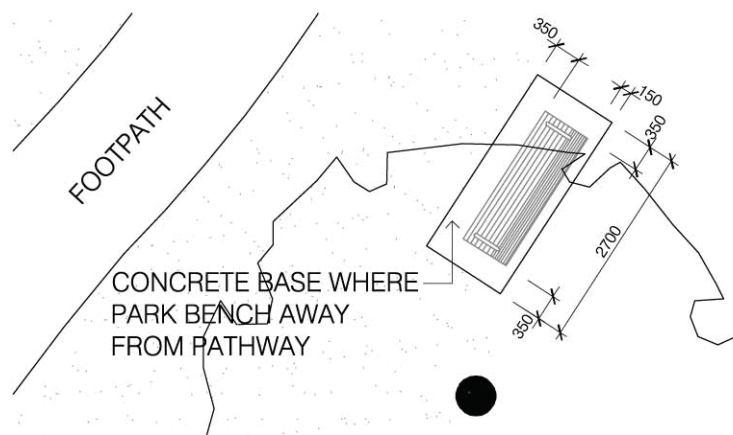
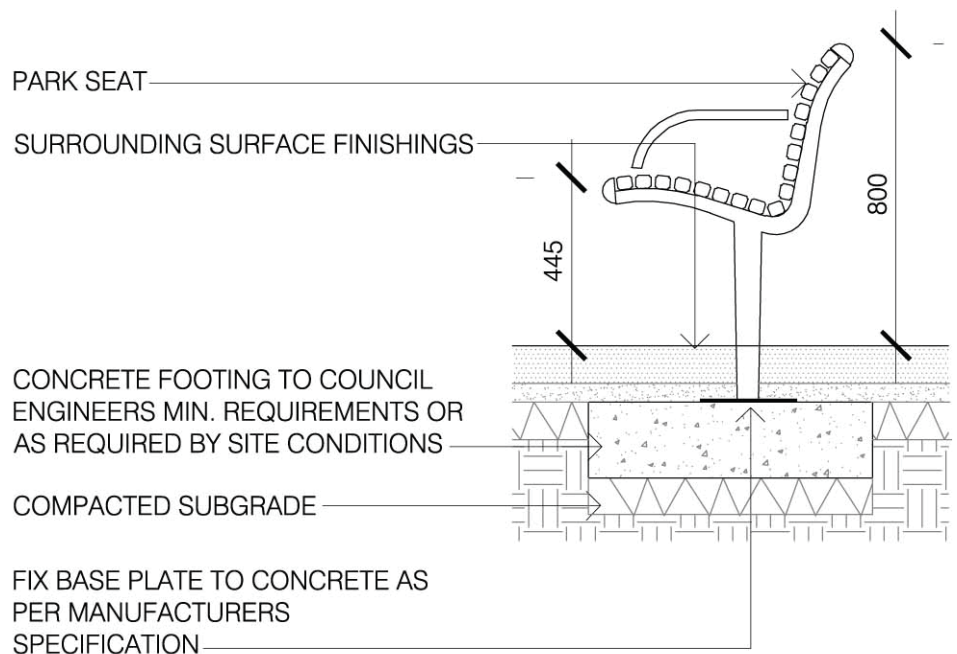
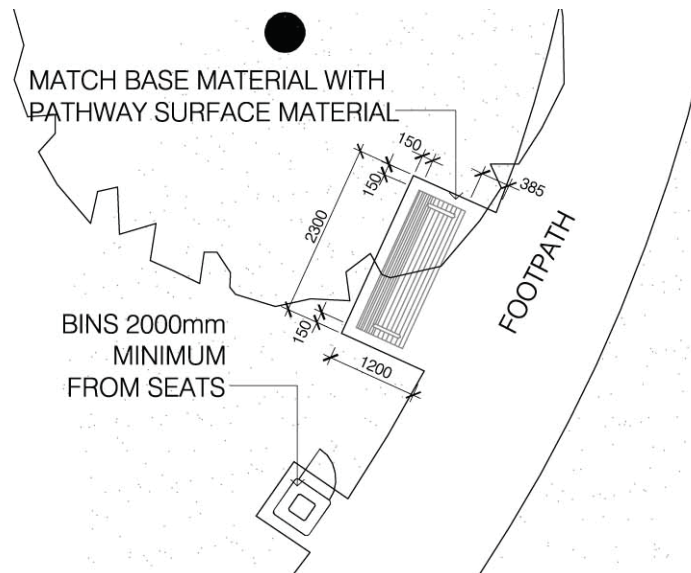
- With back to planting, wall or fence
- Face interesting view or pedestrian activity
- Locate for summer shade and winter sun
- Do not block pedestrian movement
- Locate minimum 2.0m from bin

INSTALLATION

- Subsurface fixing to mass concrete footing
- Optional armrest
- Ensure bench is level



Source: Dickson Rothschild



BIN ENCLOSURE

BI02



This bin enclosure has been custom designed to compliment Randwick City's diverse character, while providing a cohesive identity to the city.

Waste removal is a fundamental part of managing the city. The Bin Enclosure is for use across the Randwick local government area. It is made from durable stainless steel for longevity in high use areas and the coastal climate.

INDICATIVE COST

EM224: \$1698 +GST, supply only

MATERIALS AND FINISHES

- 304 stainless steel
- Polished finish

MAINTENANCE

It is essential for bins to be cleaned regularly.

A six monthly cleaning schedule is recommended in coastal environments to prevent salt and sand build-up. Water blasting is also recommended for removal of superficial 'tea' rust stains as required.

Remove and replace bin enclosure if bent or damaged.

RECOMMENDED LOCATIONS

Commercial Areas
Civic Parks
Pocket Parks
Neighbourhood Parks
District Parks
Sports Parks
Waterfront Parks

SUPPLIER

Emerdyn Pty Ltd
39 Stanley Street
Peakhurst NSW 2210

Tel: 02 9534 1314

Fax: 02 9534 5298

PRODUCT CODE

EM224

- Stainless steel
- Frame angle iron sheets
- Secure locking mechanism
- Sub-surface fixing
- RCC logo panel

BI02

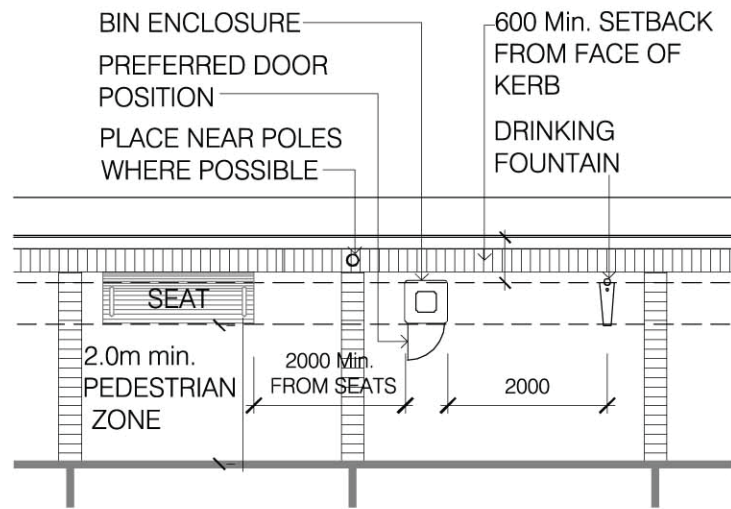
INSTALLATION

- Subsurface fixing to mass concrete footing
- Ensure bin is level

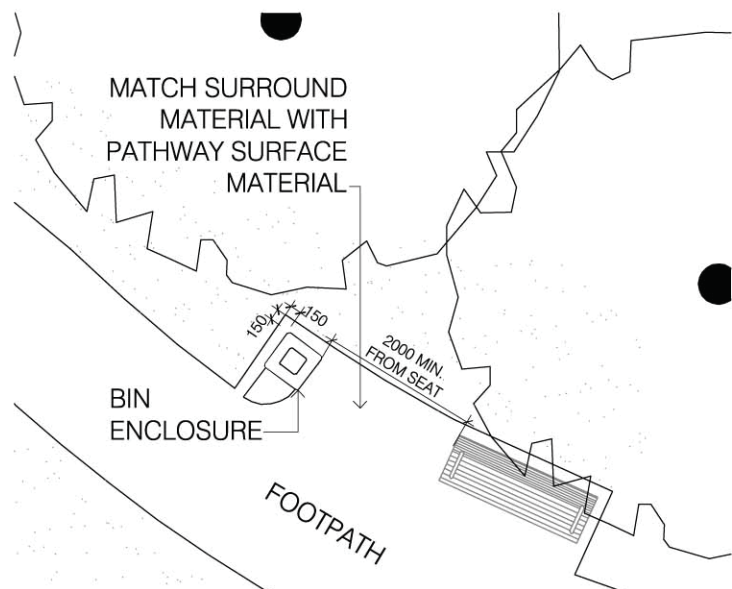


TYPICAL PLACEMENT

- 2.0m minimum distance from seats and benches
- Setback 0.6m minimum distance from face of kerb
- Do not block pedestrian movement
- Avoid street corners to maintain views lines
- Place bin near street poles where possible to reduce 'clutter'



TYPICAL CIVIC BENCH LAYOUT PLAN



TYPICAL CIVIC BENCH INSTALLATION SECTION

METAL BOLLARD

BA01



Source: Dickson Rothschild

Bollards are a signal to both drivers and pedestrians. They allow the free movement of pedestrians, while signaling no access to drivers.

The LEDA bollard has been selected for its aesthetic character, along with its durability and functional qualities. The stainless steel bollard is available in various diameters, fixed or removable.

Note: bollards need to be used in appropriate areas dependent on risk of vehicular impact. Contact the manufacturer to confirm suitability with in vehicular impact risk areas.

INDICATIVE COST

SSP 80FB: (Fixed)	\$495.00+GST, supply only
SSP 80RB: (Locking & Removable)	\$698.00+GST, supply only
SSP 100FA: (Fixed)	\$425.00+GST, supply only
SSP 150RA: (Locking & Removable)	\$1198.00+GST supply only

MATERIALS AND FINISHES

- Grade 304 stainless steel, optional Grade 316 for coastal environment
- Level 4 polished finish
- Stainless steel fixings

MAINTENANCE

A regular cleaning schedule is recommended in coastal environments to prevent salt and sand build-up. Refer to the manufacturers 'care and maintenance' instruction booklet for recommended cleaning regimes.

Remove and replace bollards if bent or damaged.

RECOMMENDED LOCATIONS

Commercial Areas
Civic Parks
Pocket Parks
Neighbourhood Parks
District Parks
Sports Parks
Waterfront Parks



Source: Dickson Rothschild

SUPPLIER

LEDA Security Products
3/43 College Street
Gladesville NSW 2111

Tel: 02 9817 4799
Fax: 02 9817 8560

PRODUCT CODES

SSP 80

- Fixed or removable bollard
- 80mm diameter
- Stainless steel
- Sub-surface fixing

Note: various diameters of bollard are available – 80-300mm

BA01

TYPICAL PLACEMENT

- Use at park entries
- Vehicular/pedestrian separation
- Maintenance vehicle access points into parks and promenades

INSTALLATION

- Subsurface fixing to mass concrete footing
- Optional removable bollard for maintenance vehicle access
- Ensure bollard is vertical
- Space bollard to prevent vehicle access, but to allow for wheel-chair and pram access.



Source: www.ledaint.com

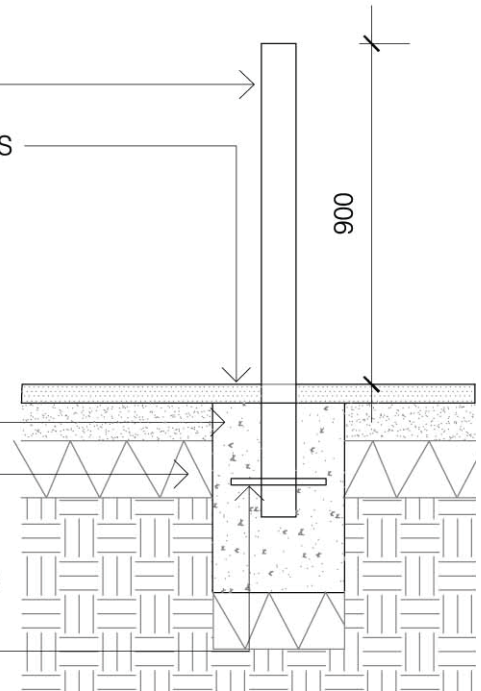
PROPOSED METAL BOLLARD
(LEDA STAINLESS STEEL)

SURROUNDING SURFACE FINISHES

CONCRETE FOOTING
TO COUNCIL ENGINEERS
MIN. REQUIREMENTS OR
AS REQUIRED BY SITE
CONDITIONS

COMPACTED SUBGRADE

FIX BASE PLATE TO CONCRETE AS
PER MANUFACTURER'S
SPECIFICATION



TYPICAL METAL BOLLARD INSTALLATION SECTION



Source: www.ledaint.com

All measurements in millimetres unless otherwise stated

DRINKING FOUNTAIN

WITH DOG BOWL

FA01



Source: Dryden Design

Drinking fountains provide convenient access to potable water in parks and commercial areas.

The optional provision of a dog bowl facility can be used where dog off leash areas are located. The Council designated dog off leash areas are:

Burrows Park, Clovelly
Pioneers Park, Malabar
Ella Reserve, South Malabar
Coral Sea Park, Maroubra
Bardon Park, Coogee
Baker Park, Coogee
Bangor Park, Coogee

Blenheim Reserve, South Coogee
Paine Reserve, Kingsford
Broadarrow Res., Maroubra Beach
Snape Park, Maroubra
Nagle Park, Maroubra
Trennery Reserve, Coogee

INDICATIVE COST

\$3,220.00 + GST, supply only

MATERIALS AND FINISHES

- Grade 316 stainless steel
- Polished satin finish
- Stainless steel fixings

MAINTENANCE

A regular cleaning schedule is recommended in coastal environments to prevent salt and sand build-up. Regularly clean the water bowls.

Remove and replace drinking fountain if bent or damaged.

RECOMMENDED LOCATIONS

Commercial Areas
Civic Parks
Pocket Parks
Neighbourhood Parks
District Parks
Sports Parks
Waterfront Parks



Source: Dryden Design

SUPPLIER

Dryden Design
23 Rose Avenue
Surrey Hills VIC 3127

Tel: 03 9830 5816
Fax: 03 9880 7335

FA01

TYPICAL PLACEMENT

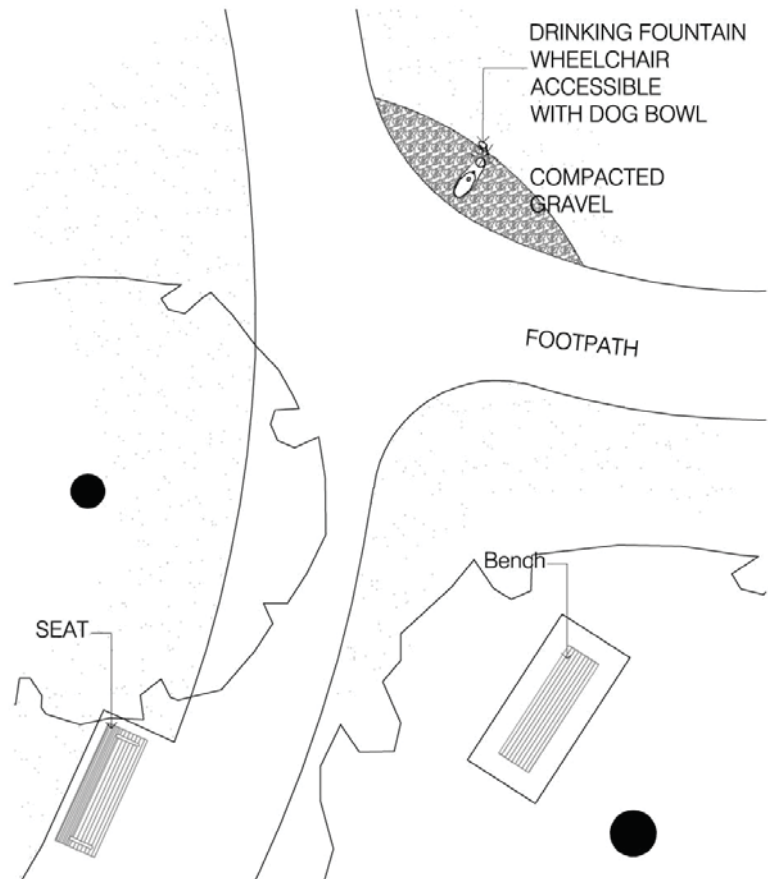
- Locate near path junctions and park entries
- Locate in visible area near playgrounds and seating
- Do not place under trees



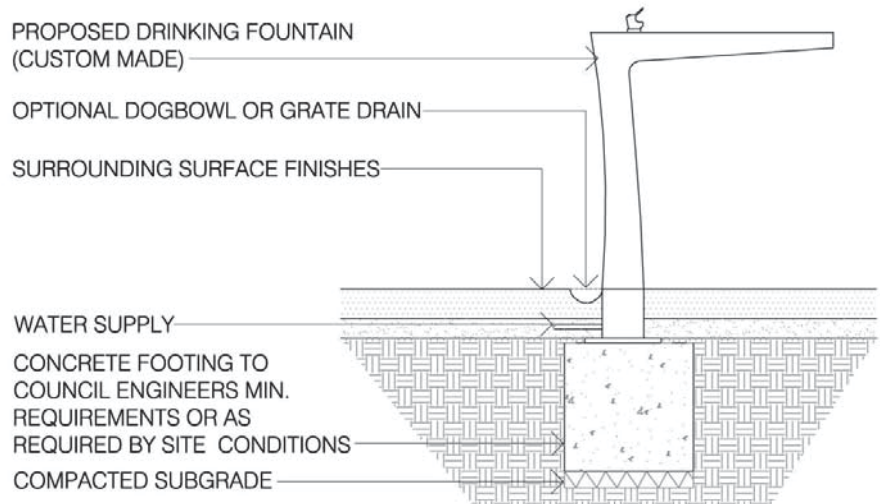
Source: Dickson Rothschild

INSTALLATION

- Subsurface fixing to mass concrete footing
- Connection to water supply and stormwater by licensed plumber



TYPICAL DRINKING FOUNTAIN LAYOUT PLAN



TYPICAL DRINKING FOUNTAIN INSTALLATION SECTION

All measurements in millimetres unless otherwise stated

BICYCLE STAND

ST01



Source: Dickson Rothschild

The bicycle stand provides cyclists with a secure parking facility, whilst remaining unobtrusive when not in use. The stand can be installed alone or in multiples depending on requirements at varying locations.

Locate at destinations for cyclists including commercial, public transport nodes and parkland areas. Provision is also required along designated cycle paths and recreation areas

Simple and practical tubular design facilitates easy access and secures bicycle parking of all sizes, manufactured in heavy-duty stainless steel. Suitable for all public areas especially education facilities, shopping centres, railway and bus stations, and park and recreational areas

INDICATIVE COST

14 Hoop SS Bike Rack: \$295.00+GST, supply only

MATERIALS AND FINISHES

- 50mm diameter stainless steel tubing
- Polished finish

MAINTENANCE

A regular cleaning schedule is recommended in coastal environments to prevent salt and sand build-up. Water blasting is also recommended for removal of superficial 'tea' rust stains as required.

Remove and replace bollards if bent or damaged.

RECOMMENDED LOCATIONS

Commercial Areas
Civic Parks
Pocket Parks
Neighbourhood Parks
District Parks
Sports Parks
Waterfront Parks



Source: www.dosmith.com.au

SUPPLIER

D.O.SMITH & SONS PTY LTD
81 Redfern Street
Wetherill Park NSW 2164
T: 02 9757 4022
F: 02 9757 4033

PRODUCT CODES

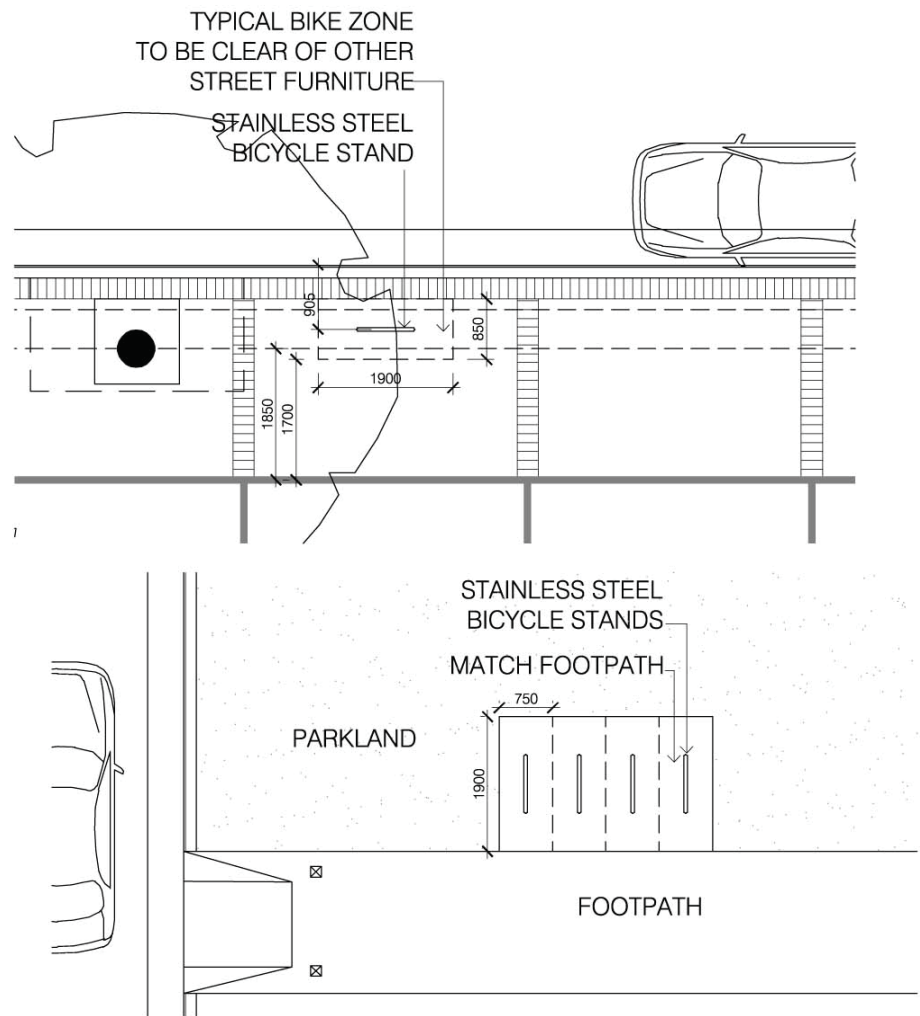
14 Hoop SS Bike Rack

- 750mm wide x 900mm high
- 50mm diameter stainless steel tube
- Sub-surface fixing

ST01

TYPICAL PLACEMENT

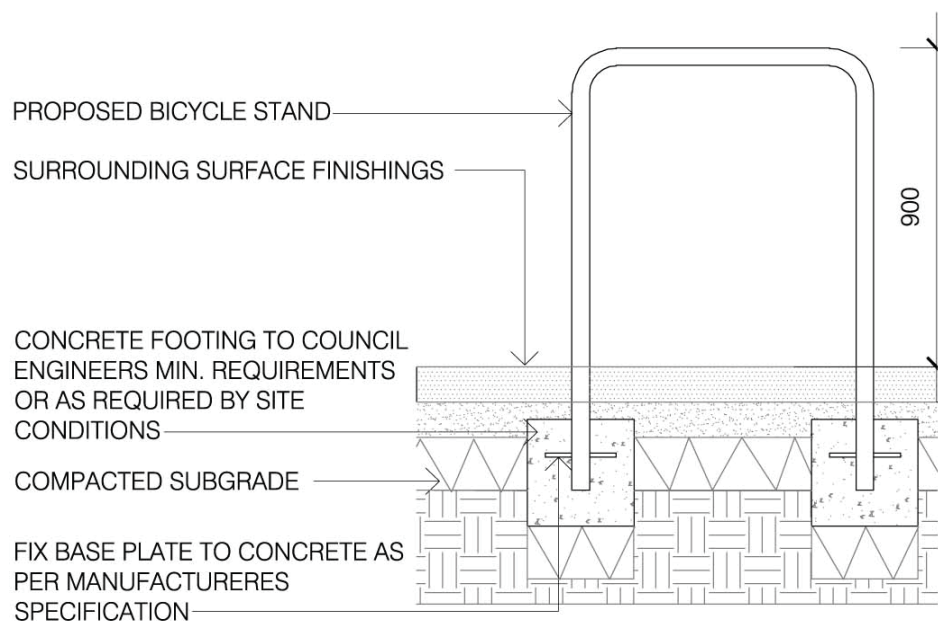
- Use at park entries
- Use in commercial areas where the footpath is wide enough
- Refer to *NSW Bicycle Guidelines*, by RTA 2003
- Place along cycle way routes, at points of interest
- Place in town centres & adjacent services including library & shopping centre etc.



TYPICAL BICYCLE STAND LAYOUT PLANS

INSTALLATION

- Subsurface fixing to mass concrete footing
- Ensure bicycle stand is vertical
- Space bicycle stand to ensure clearance for double sided storage



TYPICAL BICYCLE STAND INSTALLATION SECTION

All measurements in millimetres unless otherwise stated

NOTICE BOARD

ST02



Source: Dickson Rothschild



Source: Dickson Rothschild

The notice board is a necessary structure for community information, providing residents with a facility for announcing community information and events. Locate at busy pedestrianised areas including commercial and public transport nodes.

A simple freestanding slim line design facilitates the visual capacity to both sides of the panel. Manufacture in heavy-duty stainless steel and toughened glass to prevent vandalism.

INDICATIVE COST

TBA

MATERIALS AND FINISHES

- Grade 316 stainless steel, for coastal environment
- Polished finish
- Stainless steel fixings
- Key lock mechanism
- Toughen glass

MAINTENANCE

A regular cleaning schedule is recommended in coastal environments to prevent salt and sand build-up. Water blasting is also recommended for removal of superficial 'tea' rust stains as required.

Remove and replace bollards if bent or damaged.

RECOMMENDED LOCATIONS

Commercial Areas
Civic Parks



Source: www.insigngraphics.com.au

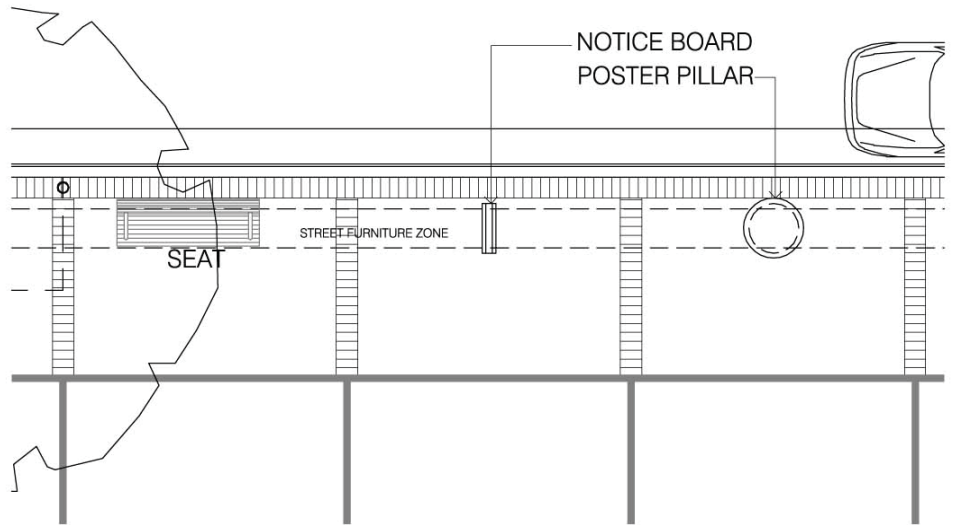
SUPPLIER

Shop construction drawings to be provided to Council for approval prior to manufacture and installation.

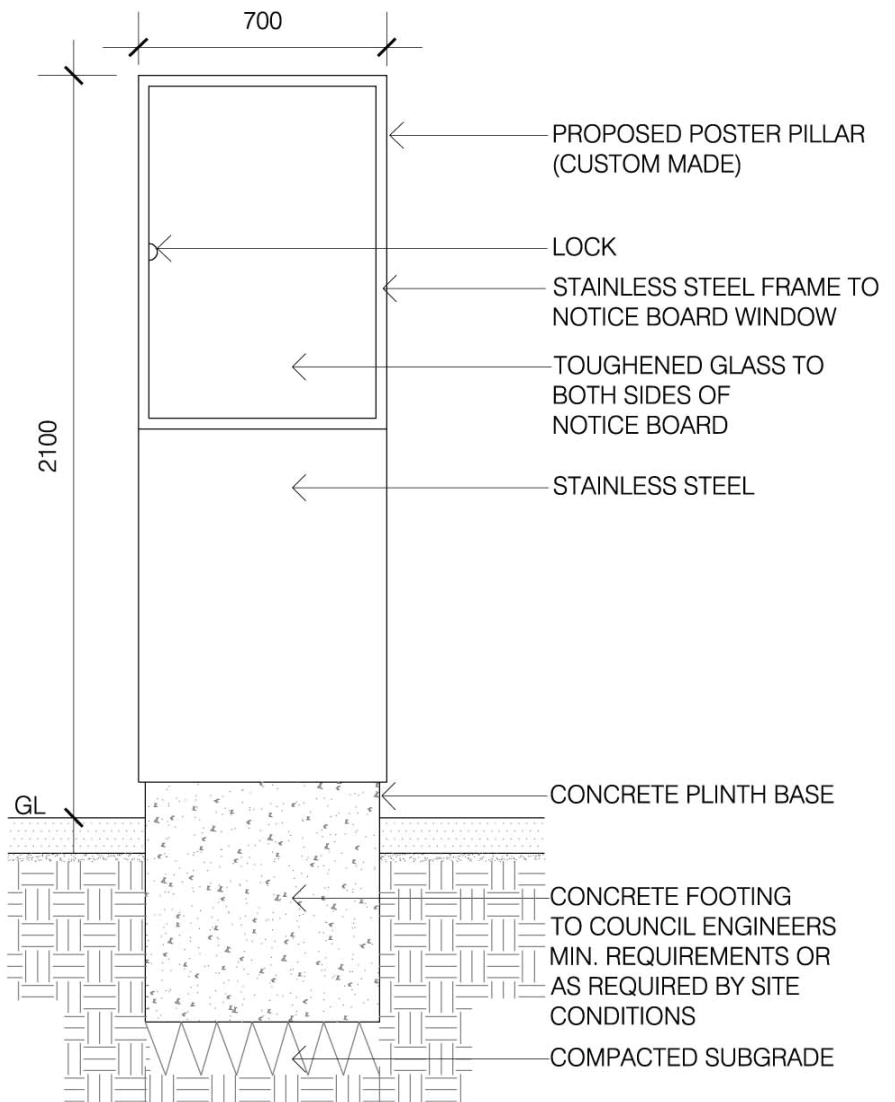
ST02

TYPICAL PLACEMENT

- Use within commercial and civic areas
- Locate with a Poster Pillar
- Do not block pedestrian movement or vehicular/traffic visibility



TYPICAL NOTICE BOARD LAYOUT PLAN



TYPICAL NOTICE BOARD INSTALLATION SECTION

INSTALLATION

- Subsurface fixing to mass concrete footing
- Align glass face with passing pedestrian traffic for greatest visual exposure
- Ensure Notice Board is vertical

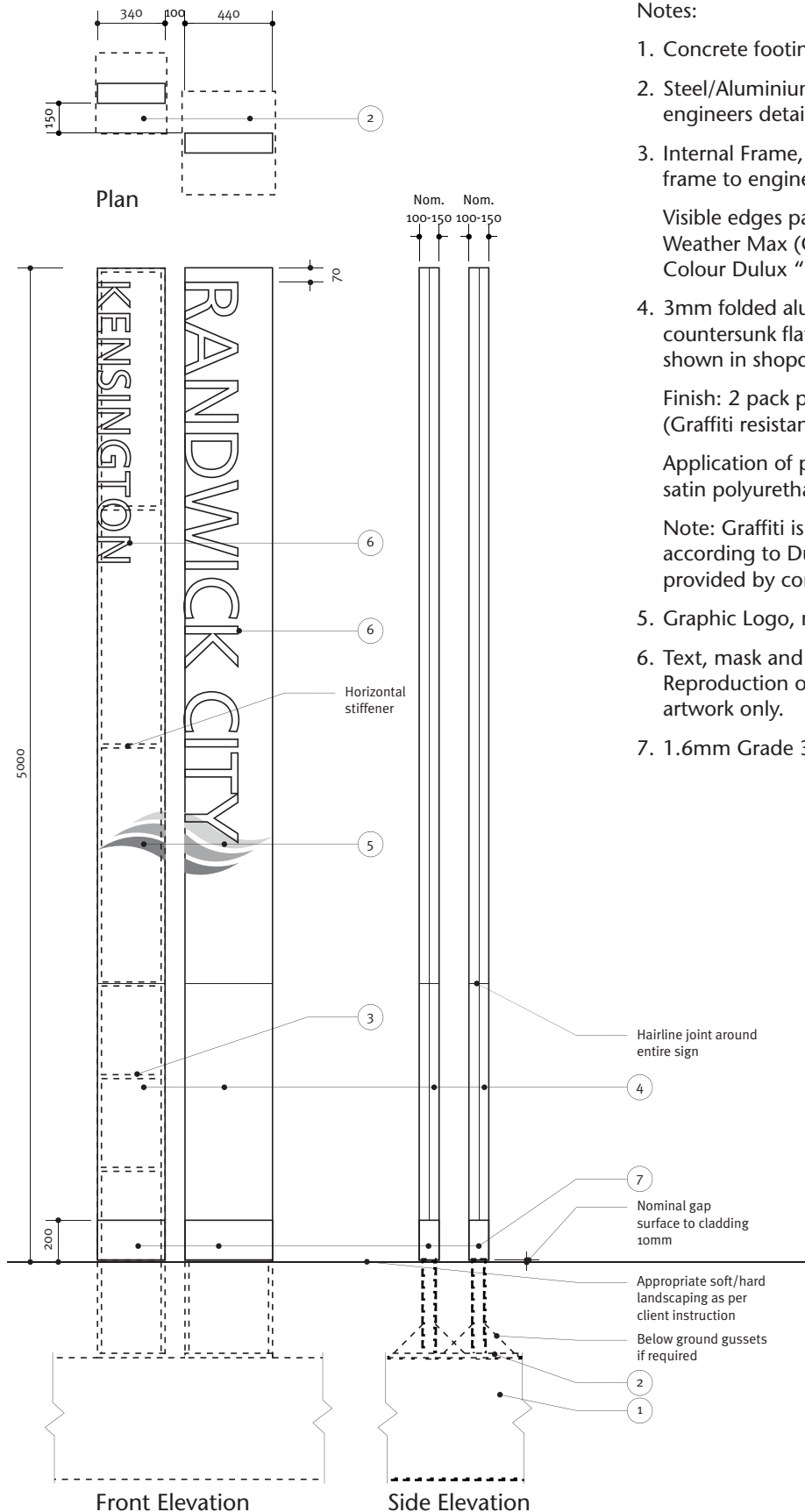
All measurements in millimetres unless otherwise stated

Signage

3

Typical Construction Specifications

1.1 LGA Marker



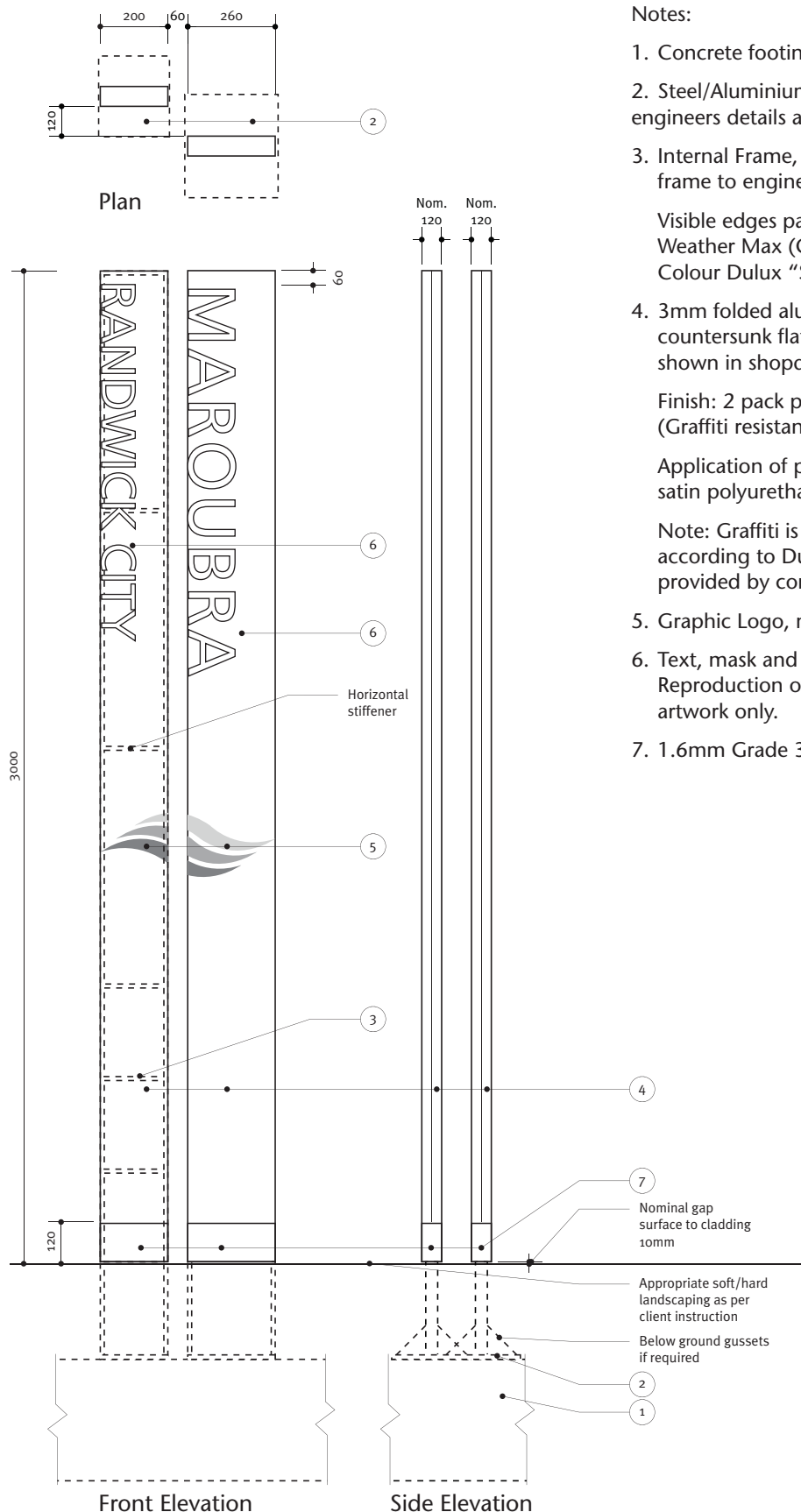
Notes:

1. Concrete footing to engineers details and certification.
2. Steel/Aluminium base plates and bolting to concrete to engineers details and certification.
3. Internal Frame, Aluminium/Galvanised mild steel welded frame to engineers details and certification.
Visible edges painted 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant).
Colour Dulux "Sparkling Aluminium".
4. 3mm folded aluminium cladding fixed to frame with countersunk flathead SS screws or similar. Positions to be shown in shopdrawing. Upper panel 3.6m, lower panel 1.4m.
Finish: 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant), colour Dulux "Sparkling Aluminium"
Application of paint: 1 coat luxepoxy Primer, 2 coats 2 pack satin polyurethane.
Note: Graffiti is removed with Dulux "Graffiti Eraser" according to Dulux product specification sheet. To be provided by contractor.
5. Graphic Logo, mask and spray, see colour specs for colour.
6. Text, mask and spray, colour Taubmans "Ink Well".
Reproduction of graphics from approved electronic artwork only.
7. 1.6mm Grade 316 Stainless Steel Skirting.

Typical Construction Specifications

1.2 Suburb Marker

Scale 1:20



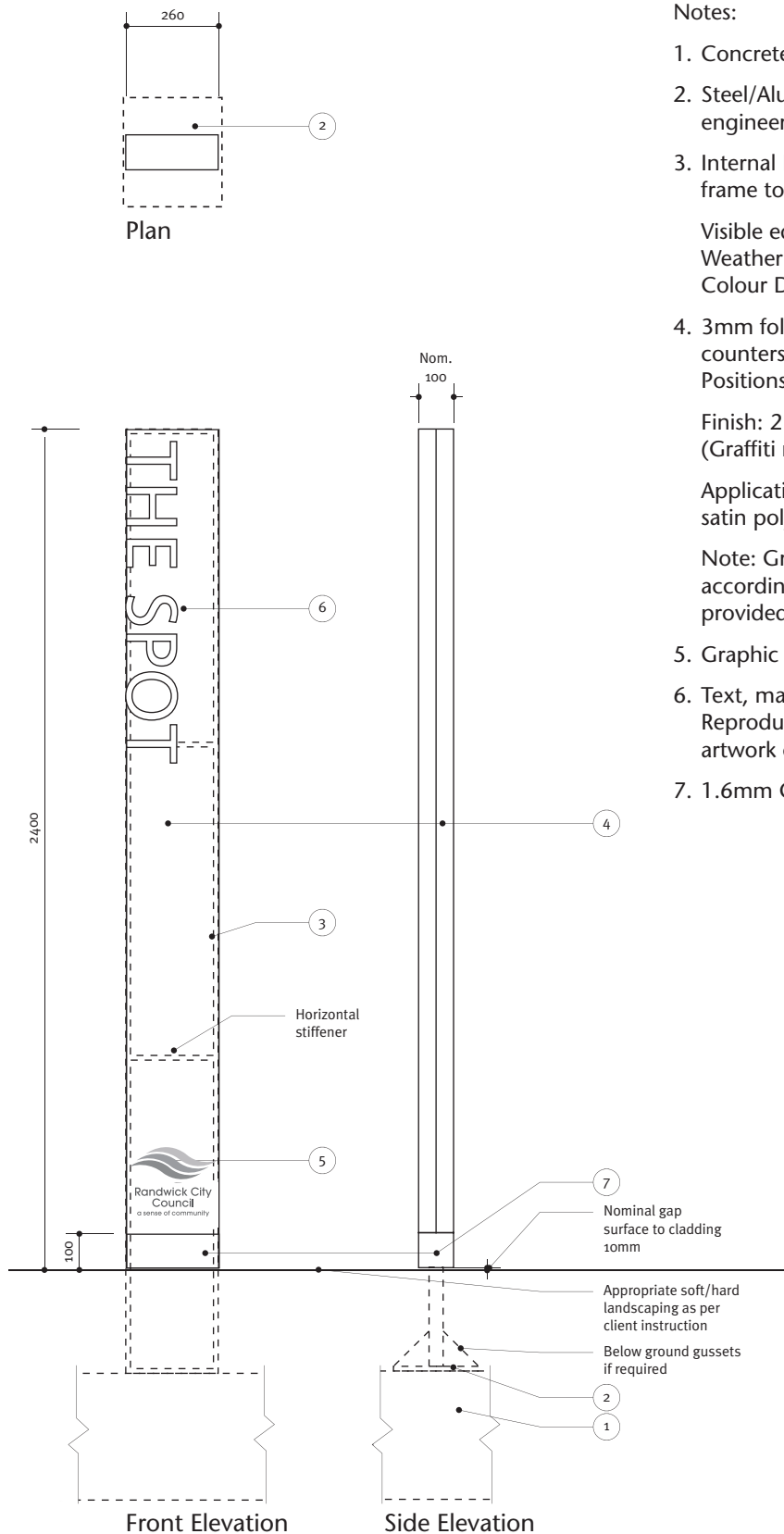
Notes:

1. Concrete footing to engineers details and certification.
2. Steel/Aluminium base plates and bolting to concrete to engineers details and certification.
3. Internal Frame, Aluminium/Galvanised mild steel welded frame to engineers details and certification.
Visible edges painted 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant).
Colour Dulux "Sparkling Aluminium".
4. 3mm folded aluminium cladding fixed to frame with countersunk flathead SS screws or similar. Positions to be shown in shopdrawing.
Finish: 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant), colour Dulux "Sparkling Aluminium"
Application of paint: 1 coat luxepoxy Primer, 2 coats 2 pack satin polyurethane.
Note: Graffiti is removed with Dulux "Graffiti Eraser" according to Dulux product specification sheet. To be provided by contractor.
5. Graphic Logo, mask and spray, see colour specs for colour.
6. Text, mask and spray, colour Taubmans "Ink Well".
Reproduction of graphics from approved electronic artwork only.
7. 1.6mm Grade 316 Stainless Steel Skirting.

Typical Construction Specifications

1.3 Place Marker

Scale 1:20



Notes:

1. Concrete footing to engineers details and certification.
2. Steel/Aluminium base plates and bolting to concrete to engineers details and certification.
3. Internal Frame, Aluminium/Galvanised mild steel welded frame to engineers details and certification.

Visible edges painted 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant).

Colour Dulux "Sparkling Aluminium".

4. 3mm folded aluminium cladding fixed to frame with countersunk flathead SS screws or similar. Positions to be shown in shopdrawing.

Finish: 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant), colour Dulux "Sparkling Aluminium"

Application of paint: 1 coat luxepoxy Primer, 2 coats 2 pack satin polyurethane.

Note: Graffiti is removed with Dulux "Graffiti Eraser" according to Dulux product specification sheet. To be provided by contractor.

5. Graphic Logo, mask and spray, see colour specs for colour.
6. Text, mask and spray, colour Taubmans "Ink Well". Reproduction of graphics from approved electronic artwork only.
7. 1.6mm Grade 316 Stainless Steel Skirting.

Typical Construction Specifications

1.4 Street Sign

Scale 1:20

Notes:

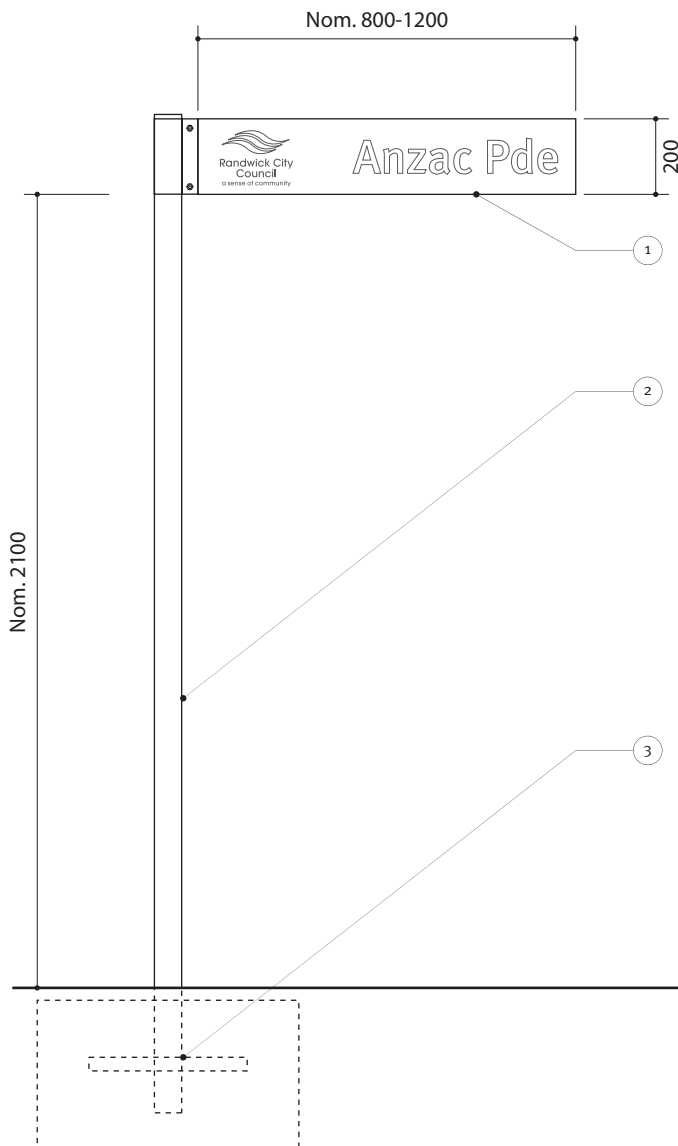
1. Proprietary finger directional system. (Blade and bracket)
Similar/same to HV Guide Systems, G5 Series.
www.hvsigns.com.au
02 4967 4722

Finish: 2 pack polyurethane satin

Colour: Dulux "Sparkling Aluminium"

Clear coat protection finish over vinyl graphics.
3M "Duranodic" vinyl.

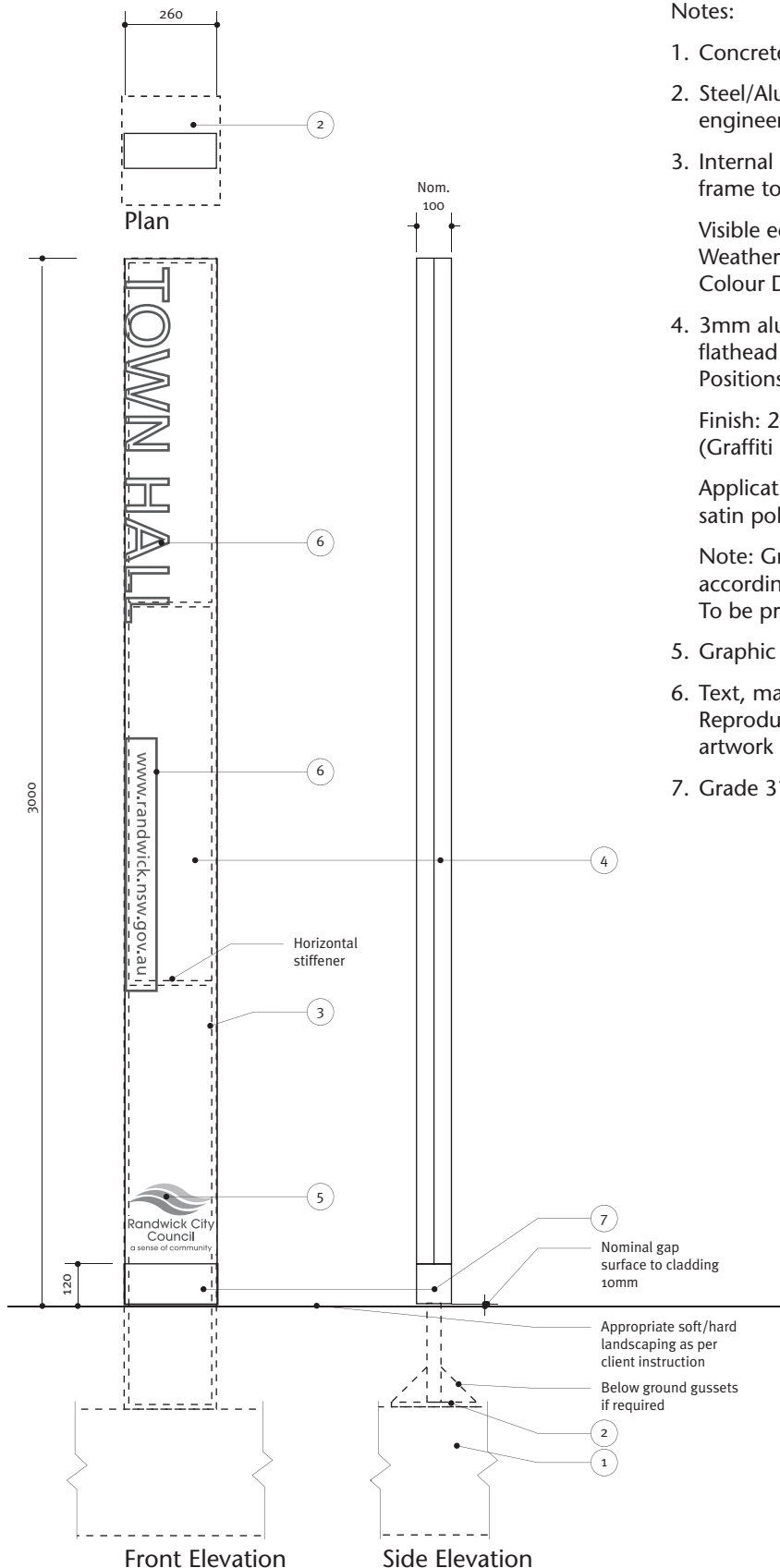
2. Existing pole or 60mmØ hot dipped gal. pole.
3. Direct embedment footing with anti-twist bar welded to pole. Hard/soft landscaping to cover footing.



Typical Construction Specifications

5.1 Facility Marker

Scale 1:20



Notes:

1. Concrete footing to engineers details and certification.
2. Steel/Aluminium base plates and bolting to concrete to engineers details and certification.
3. Internal Frame, Aluminium/Galvanised mild steel welded frame to engineers details and certification.
Visible edges painted 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant).
Colour Dulux "Sparkling Aluminium".
4. 3mm aluminium cladding fixed to frame with countersunk flathead SS screws or similar.
Positions to be shown in shopdrawing.
Finish: 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant), colour Dulux "Sparkling Aluminium".
Application of paint: 1 coat luxepoxy Primer, 2 coats 2 pack satin polyurethane.
Note: Graffiti is removed with Dulux "Graffiti Eraser" according to Dulux product specification sheet.
To be provided by contractor.
5. Graphic Logo, mask and spray, see colour specs for colour.
6. Text, mask and spray, colour Taubmans "Ink Well".
Reproduction of graphics from approved electronic artwork only.
7. Grade 316 Stainless Steel Skirting.

Typical Construction Specifications

5.2 Wall Mounted Sign

Scale 1:20

Notes:

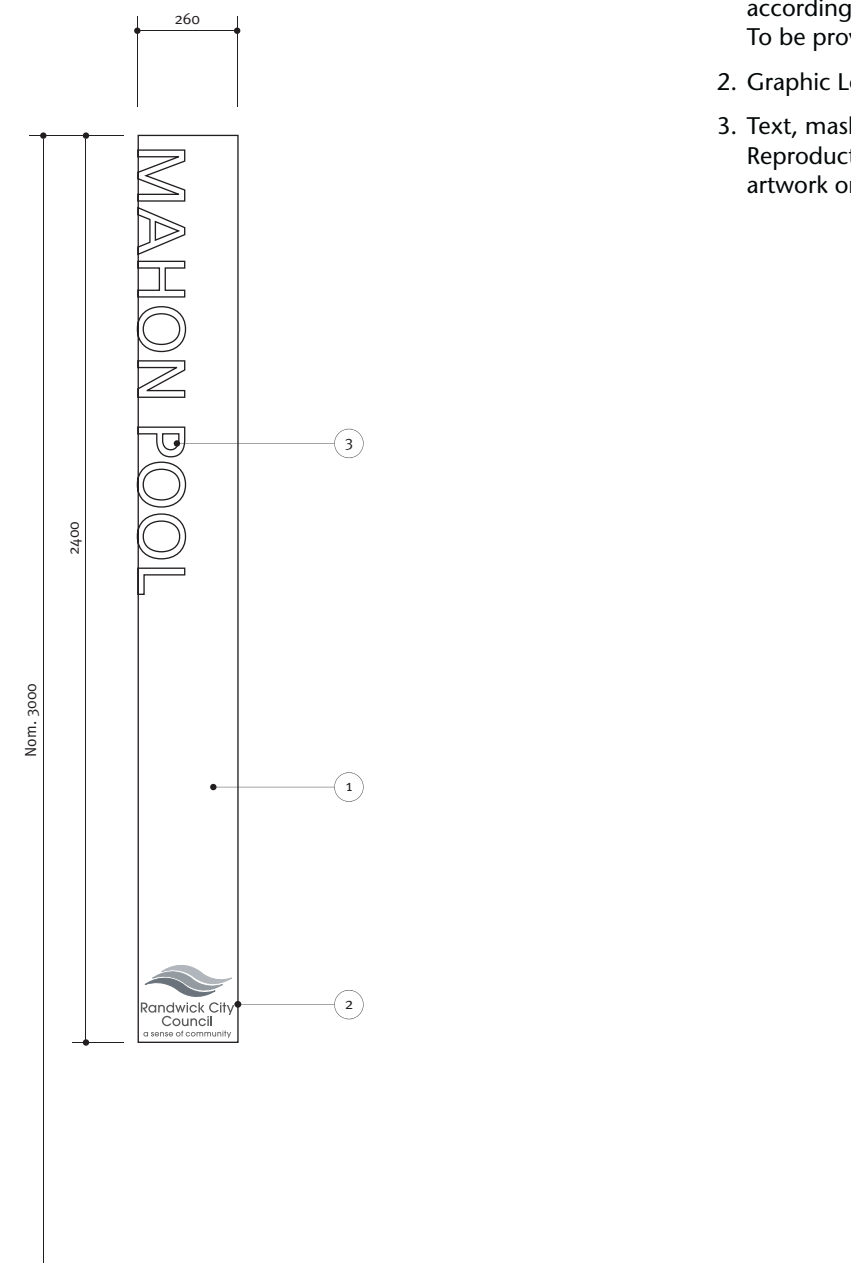
1. 3mm aluminium cladding invisibly fixed to wall.

Finish: 2 pack polyurethane, luxathane or Weather Max (Graffiti resistant), colour Dulux "Sparkling Aluminium".

Application of paint: 1 coat luxepoxy Primer, 2 coats 2 pack satin polyurethane.

Note: Graffiti is removed with Dulux "Graffiti Eraser" according to Dulux product specification sheet. To be provided by contractor.

2. Graphic Logo, mask and spray, see colour specs for colour.
3. Text, mask and spray, colour Taubmans "Ink Well".
Reproduction of graphics from approved electronic artwork only.



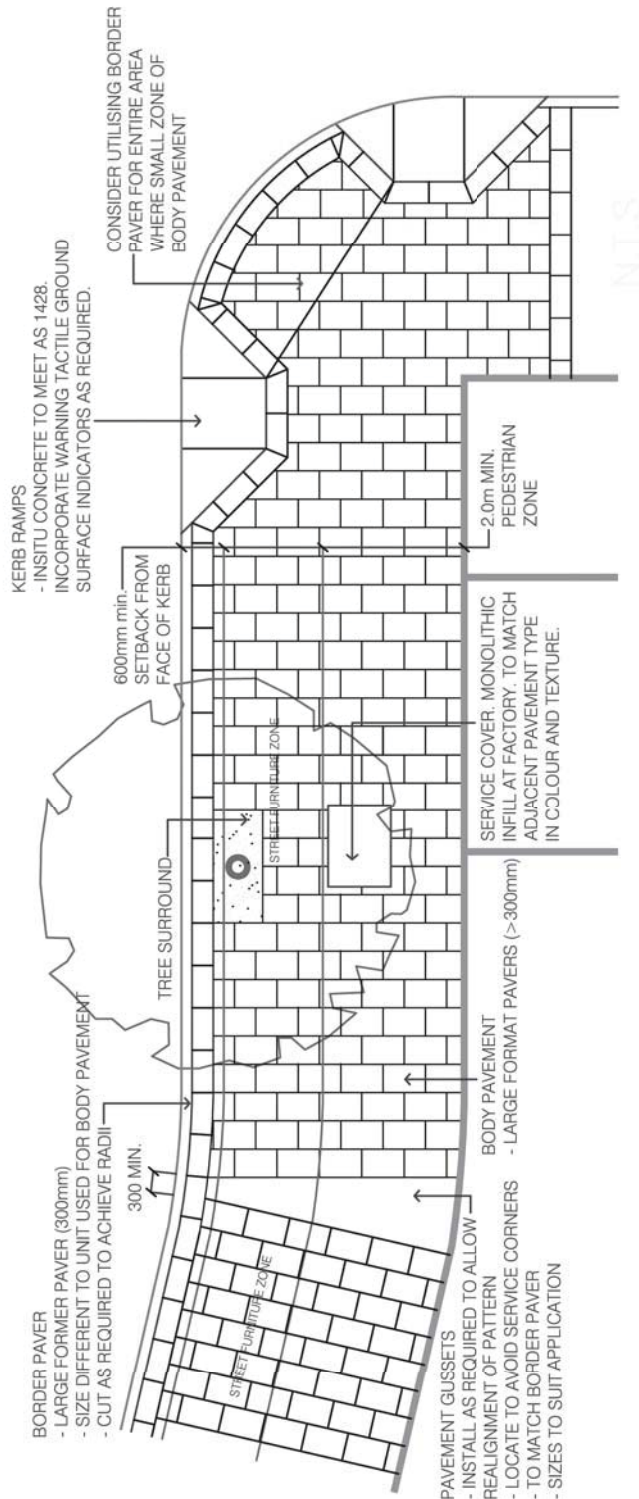
Paving Styles

4

PAVING STYLE No 01

RCC CITY PAVER

PA01



RECOMMENDED LOCATIONS

Commercial Areas:
Primary commercial streets with high pedestrian use areas.

MATERIALS

BODY OF PAVEMENT

Pebblecrete PPX1201:SD or approved equal.

Large format paver generally 400x600mm or 300x600mm. Thickness 40 or 60mm thick. Semi honed finish.

Stretecher pattern with alternate rows aligned.

Staggered joints along line of travel.

BORDER PAVER

Pebblecrete PPX 120D :SB or approved equal.

Typically large format paver 300x600mm light shot blast finish.

Cut pavers to achieve radius at corner.

NOTE

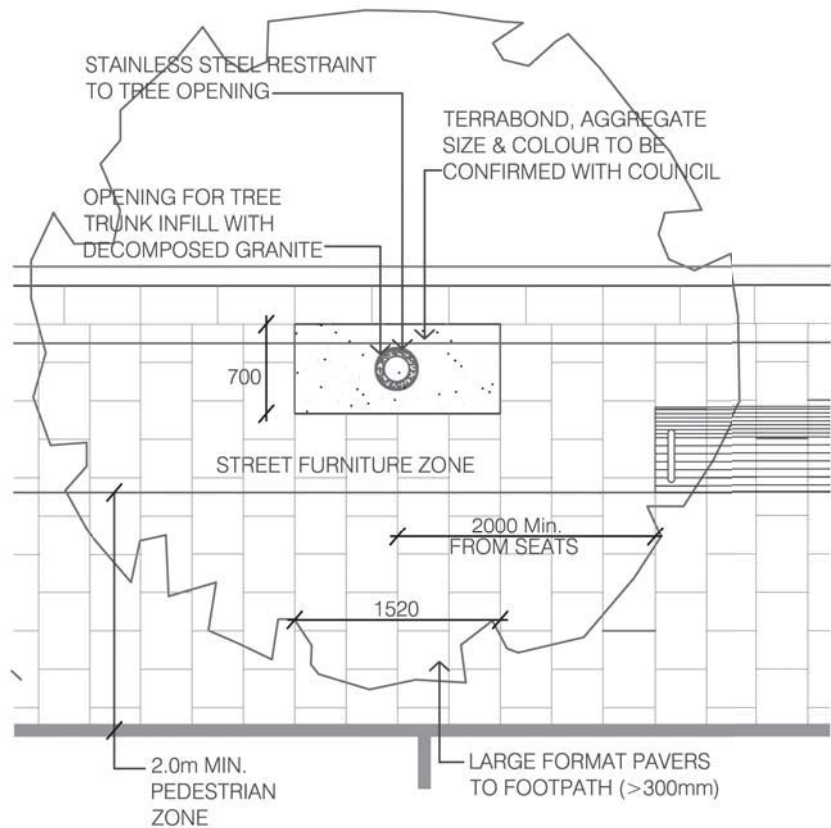
- * Pattern shown indicative only.
- * Actual unit size to be determined by designer to suit local conditions.
- * Cut edges of pavers may need to be rechamfered where abutting chamfered edge.

TYPICAL PAVING STYLE 1

PA01

TYPICAL PLACEMENT

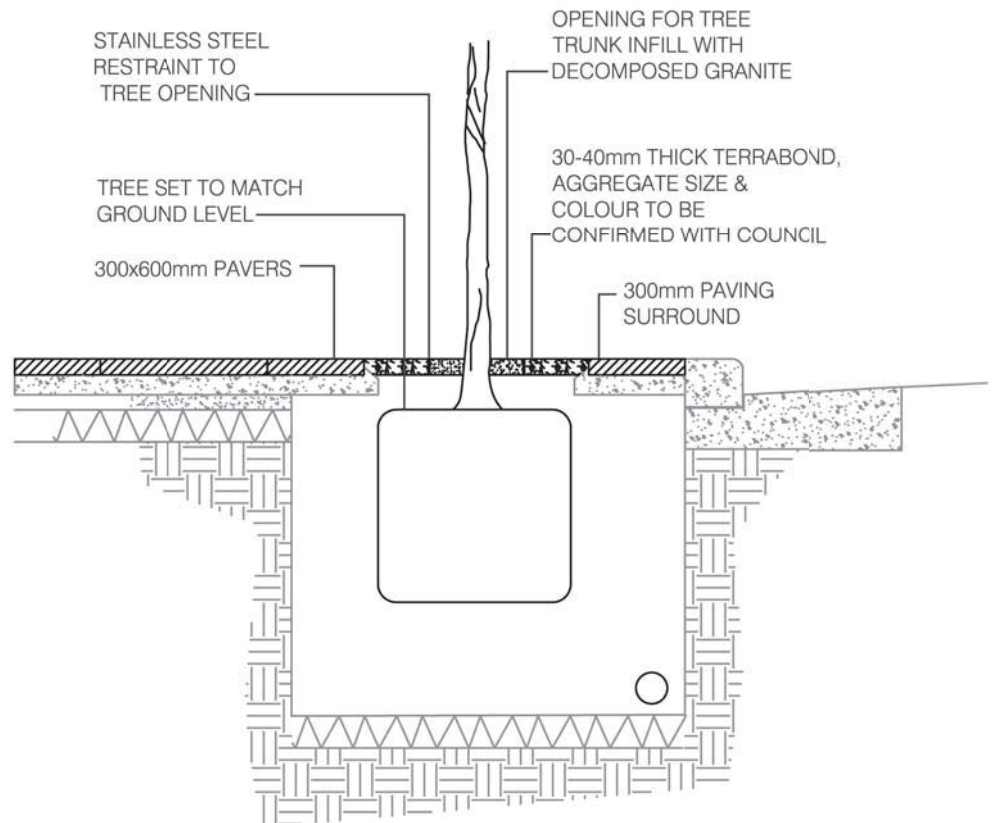
- * Tree surround to be adjacent and at right angles to kerb.
- * Tree placement is to not block pedestrian flow.
- * Avoid corners and maintain view lines for pedestrians and vehicles.
- * Place in line with shop boundaries to maintain views to shop windows and awning signage.



TYPICAL TREE SURROUND LAYOUT PLAN

INSTALLATION

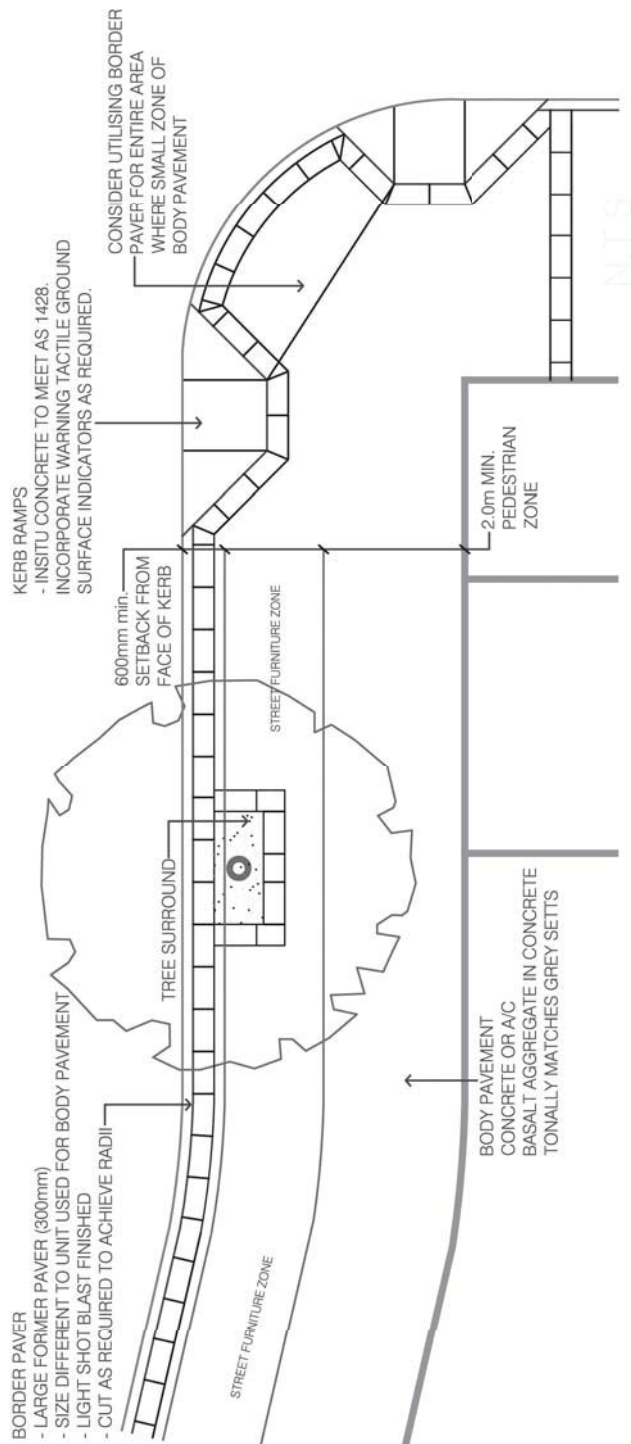
- * Set tree surround flush with surrounding pavement.
- * Cut stone as required
- * Minimum size 200 x 300mm



TYPICAL TREE SURROUND INSTALLATION SECTION

GENERIC BANDING PAVING STYLE No 02

PA02



TYPICAL PAVING STYLE 3

RECOMMENDED LOCATIONS

Commercial Areas:
Secondary streets in town centres and primary streets in villages.

MATERIALS

BODY OF PAVEMENT

Concrete or Asphaltic Concrete (A/C).

BORDER PAVES

Pebblecrete PPX1201:120D:SB or approved equal.

Typically large format paver 300x 600mm light shot blast finish.

Cut pavers to achieve radius at corner.

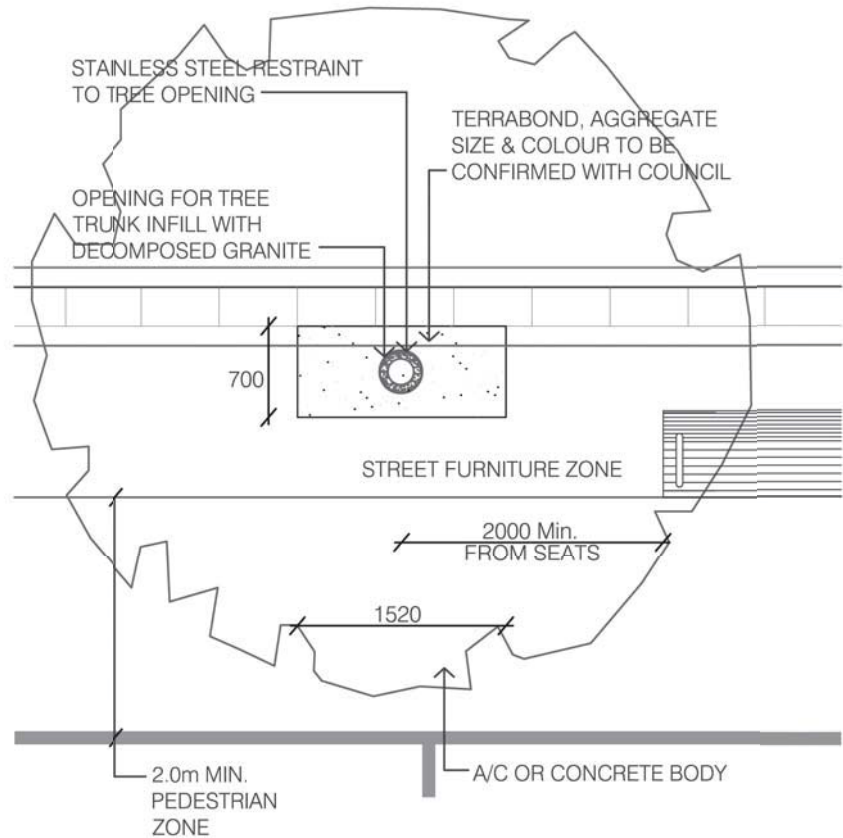
NOTE

- * Pattern shown indicative only.
- * Actual unit size to be determined by designer to suit local conditions.
- * Cut edges of pavers may need to be rechamfered where abutting chamfered edge.

PA02

TYPICAL PLACEMENT

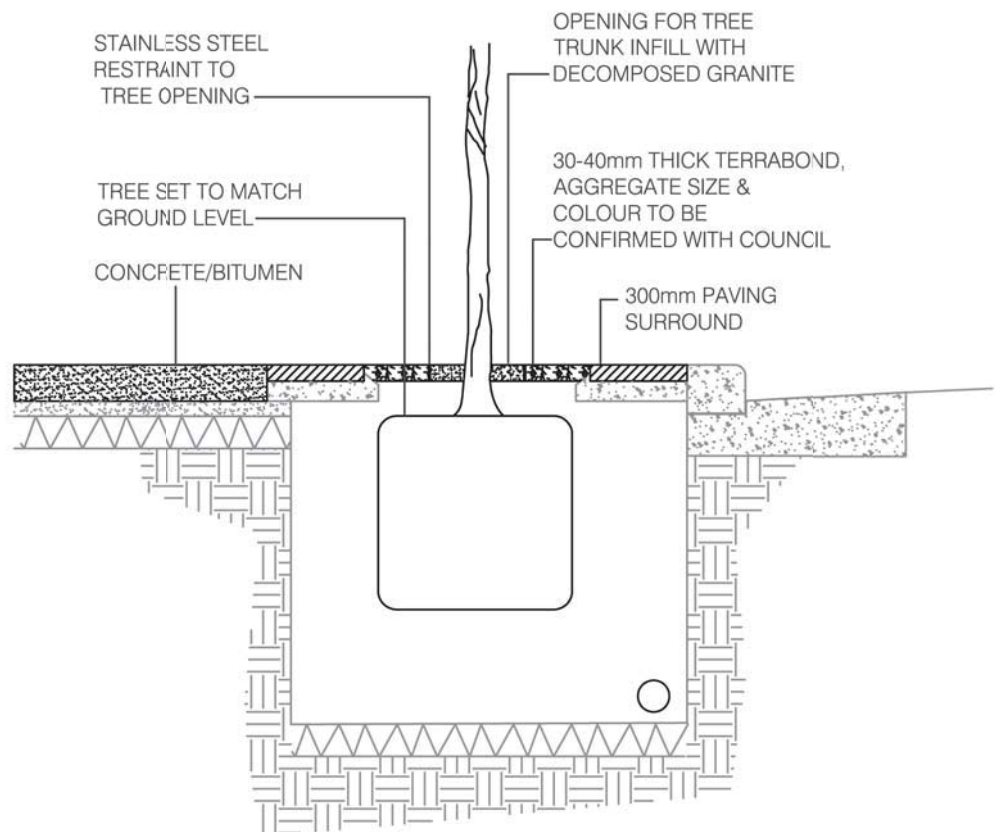
- * Tree surround to be adjacent and at right angles to kerb.
- * Tree placement is to not block pedestrian flow.
- * Avoid corners and maintain view lines for pedestrians and vehicles.
- * Place in line with shop boundaries to maintain views to shop windows and awning signage.



TYPICAL TREE SURROUND LAYOUT PLAN

INSTALLATION

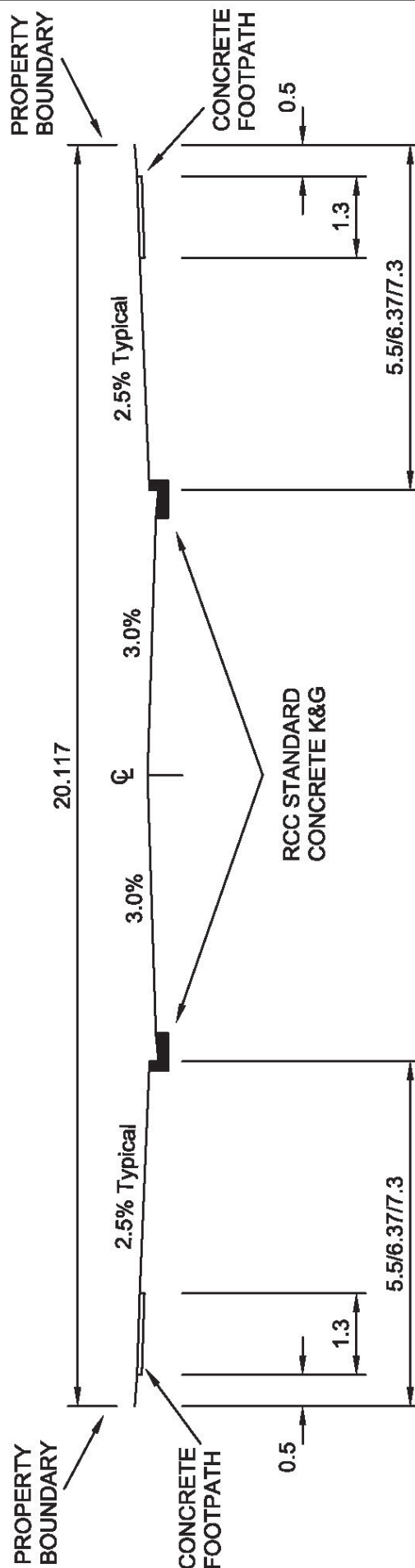
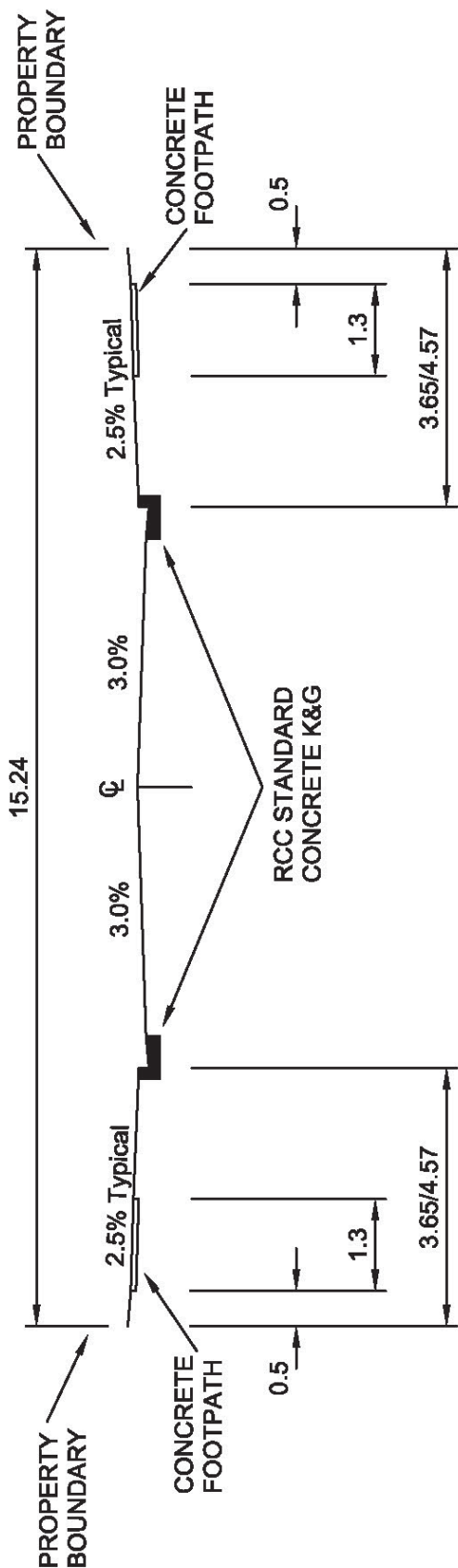
- * Set tree surround flush with surrounding pavement.
- * Cut stone as required
Minimum size
200 x 300mm



TYPICAL TREE SURROUND INSTALLATION SECTION

Standard Details

5



TYPICAL ROAD CROSS SECTIONS

CITY OF RANDWICK

DRAWN BYS. Forsyth

DESIGNED S. Forsyth

DATE 15/02/10

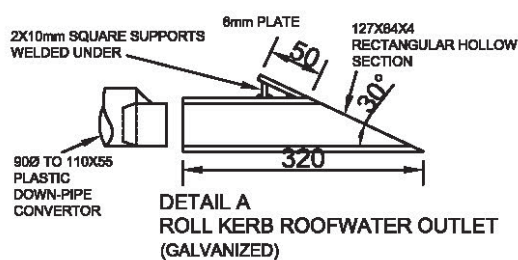
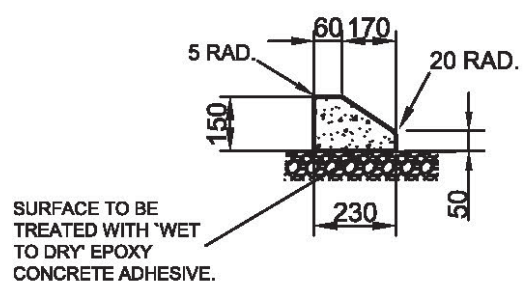
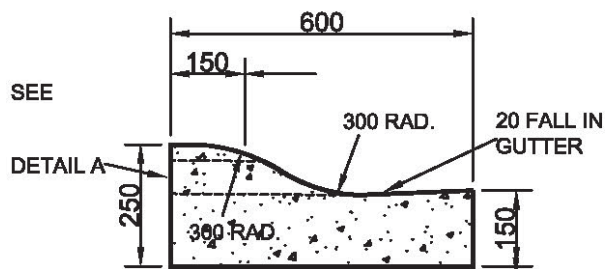
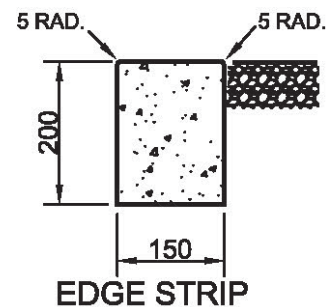
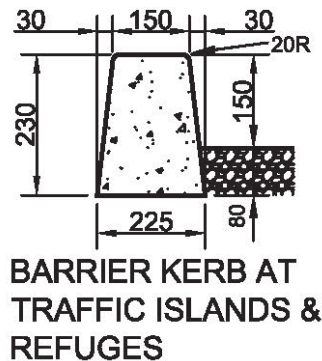
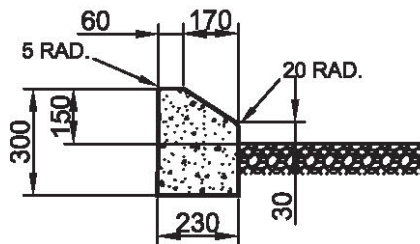
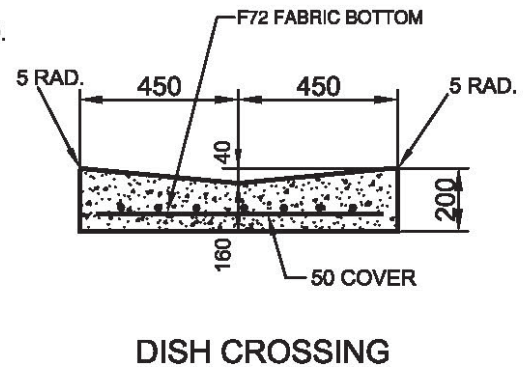
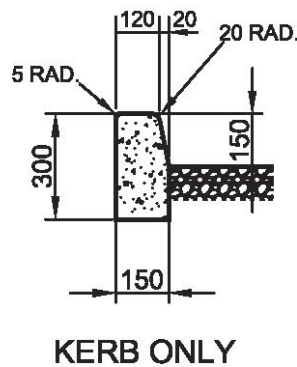
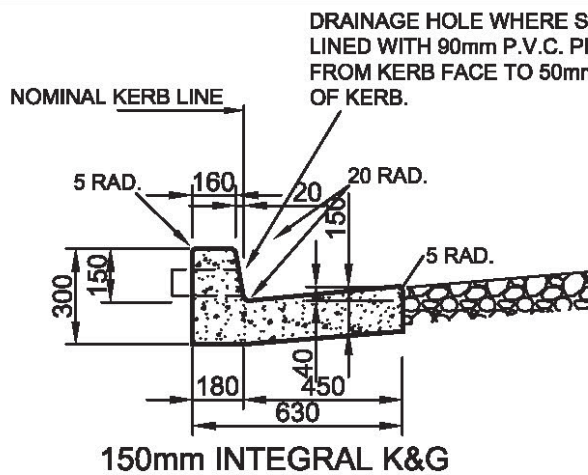
CHECKED J. Ingegneri

APPROVED
ENGINEER M. Shaw

TYPICAL ROAD CROSS SECTIONS

SCALE:
1:100

PLAN No.
SD1

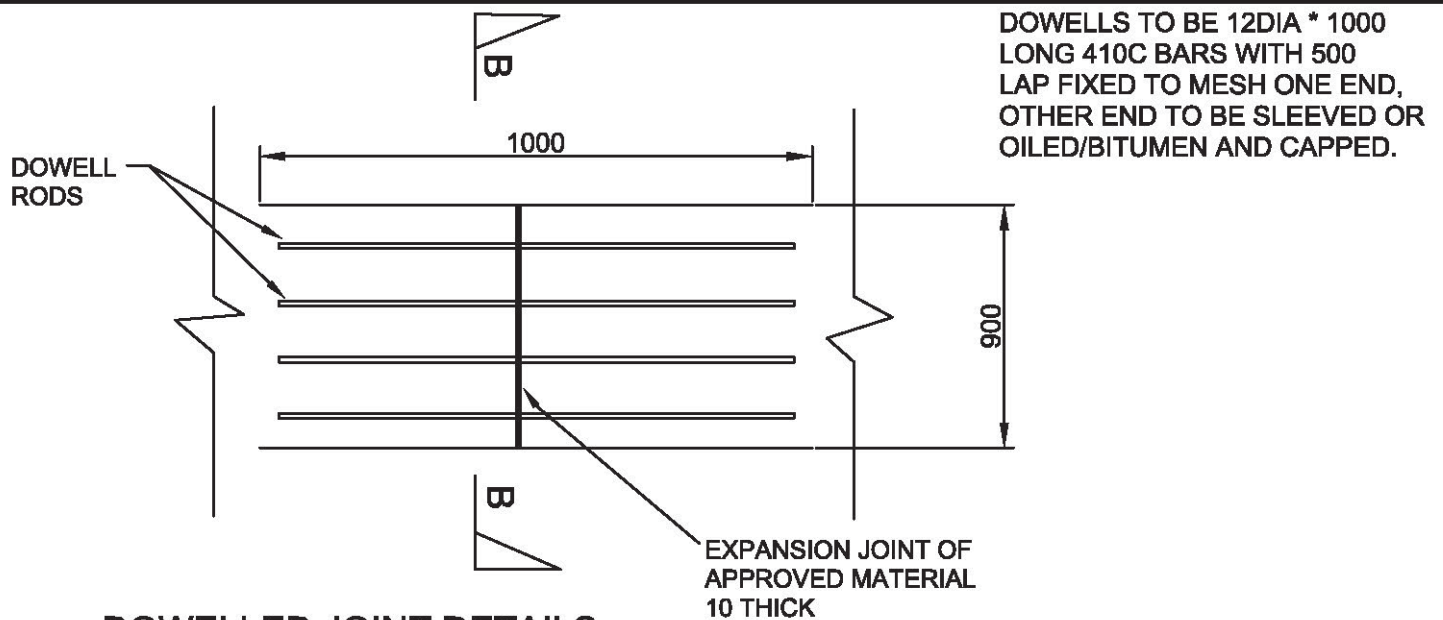


NOTES:

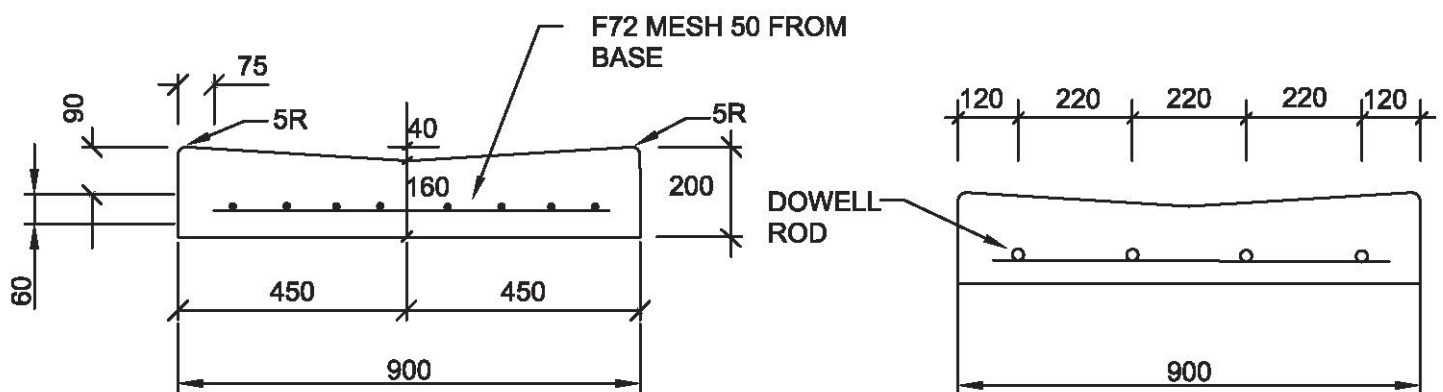
1. ROAD SUB-BASE TO BE EXTENDED BENEATH KERBS, GUTTERS, APRONS AND DISH CROSSINGS.
2. ALL CONCRETE TO BE 32MPa COMPRESSIVE STRENGTH AT 28 DAYS.
3. REINFORCING FABRIC TO AUSTRALIAN STANDARD 1304-1991 (WELDED WIRE REINFORCING FABRIC FOR CONCRETE).
4. ROOF WATER OUTLETS 90mm DIA. TO BE PROVIDED OPPOSITE LOW SIDE OF EVERY LOT. INVERT OF OUTLET TO BE LEVEL WITH INVERT OF GUTTER.
5. EXPANSION JOINTS OF APPROVED BITUMINOUS FILLER 10mm THICK AT MAXIMUM SPACING OF 6.0m INTERVALS SHALL BE PROVIDED.
6. CONTRACTION JOINTS SHALL BE PROVIDED AT 3.0m INTERVALS.

CITY OF RANDWICK

DRAWN BY NMcfall	CHECKED J Ingegneri	STANDARD KERBS & GUTTERS	SCALE: NTS
DESIGNED NMcfall	APPROVED ENGINEER M Shaw		PLAN No. SD2
DATE 28/01/10			

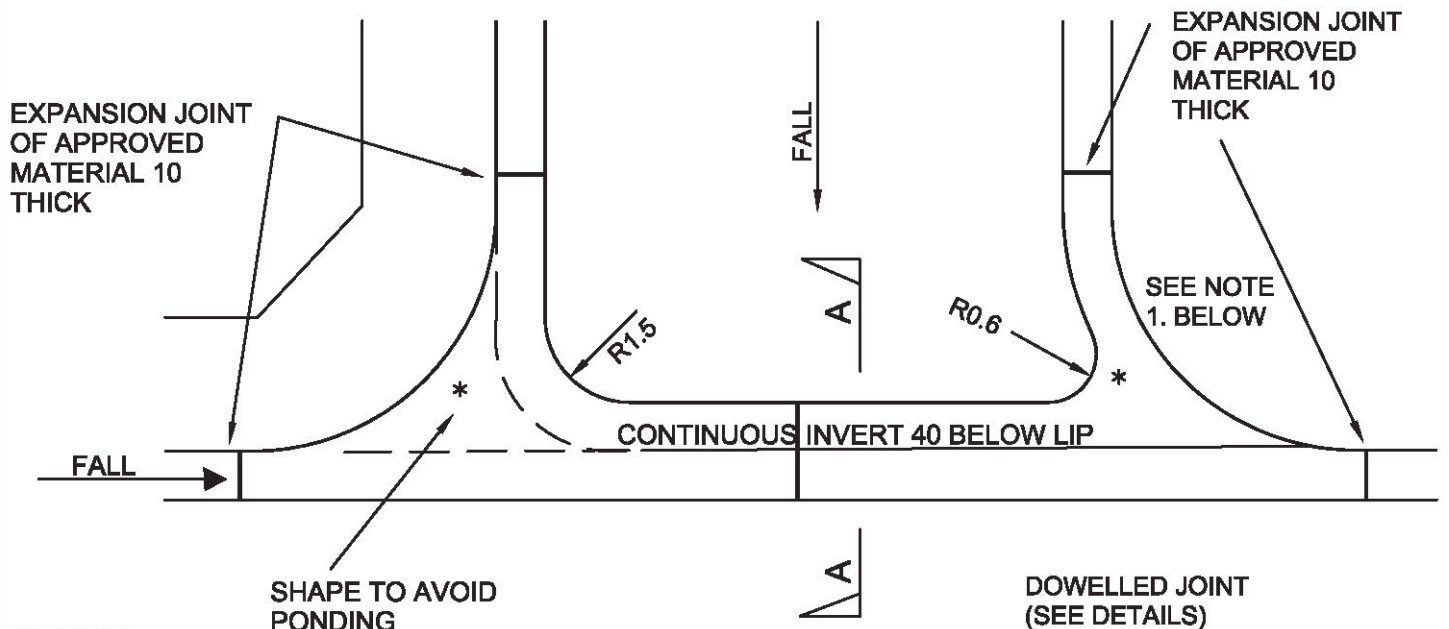


DOWELLED JOINT DETAILS



DISH CROSSING SECTION

SECTION B-B

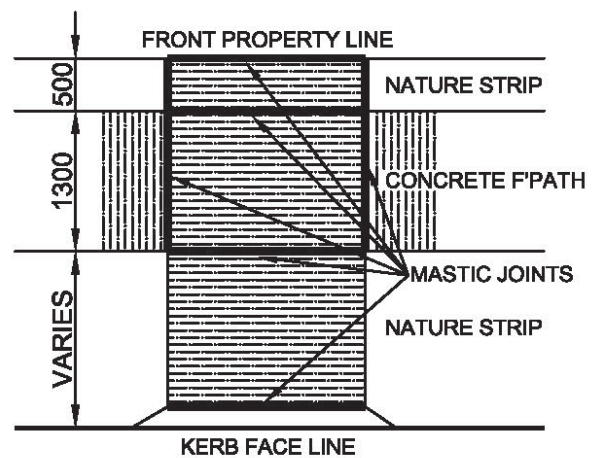
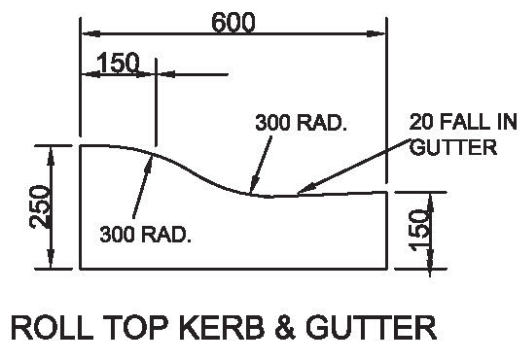
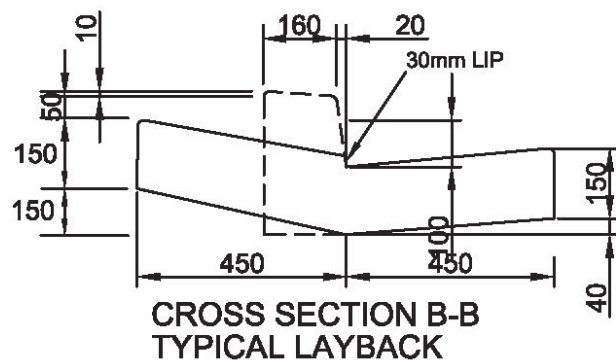
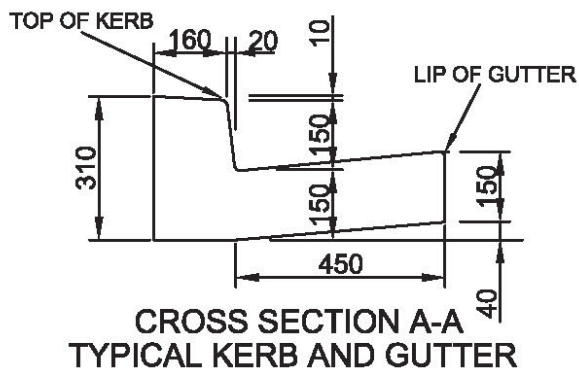
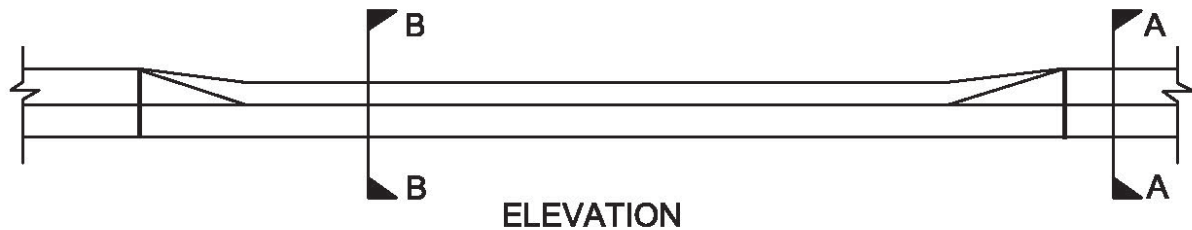
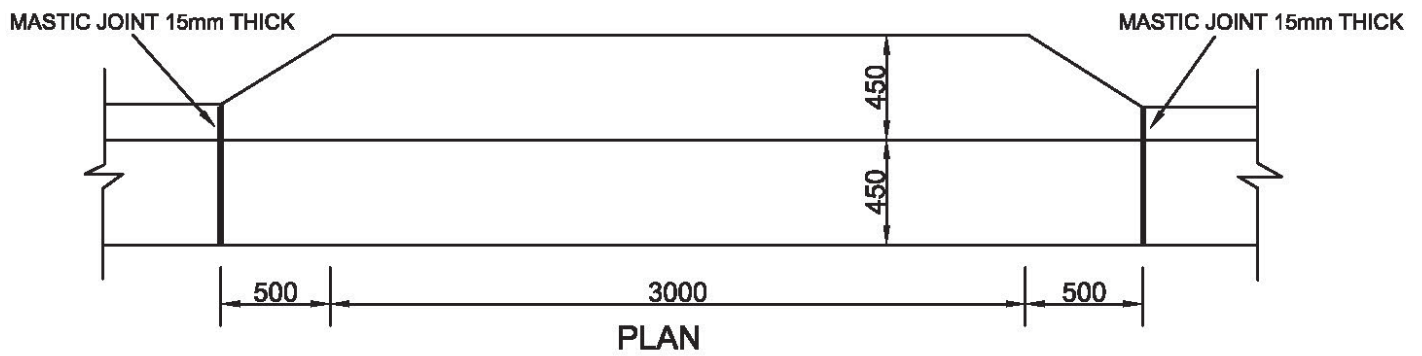


PLAN

NOTE 1.*
GUTTER TO BE 150 THICK
REINFORCED WITH F72
MESH AND FORMED INTEGRAL
WITH KERB

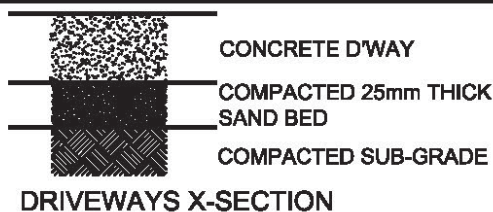
NOTE:
ALL CONCRETE TO BE 32MPa
COMPRESSIVE STRENGTH AT 28 DAYS.

DRAWN BY	NMcFall	CHECKED	J Ingegneri	CITY OF RANDWICK	SCALE:
DESIGNED	NMcFall	APPROVED	M Shaw		NTS
DATE	28/01/10	ENGINEER		STANDARD DISH CROSSING DETAILS	PLAN No. SD3



NOTES:

1. COMPRESSIVE STRENGTH OF CONCRETE TO BE 32 MPa AT 28 DAYS.
2. THE ROAD BASE COURSE IS TO BE EXTENDED BENEATH THE KERB & GUTTER.
3. DRIVEWAYS SUB-GRADE AND SAND BED COURSE TO BE THOROUGHLY COMPACTED WITH MECHANICAL HAND HELD COMPACTORS AND FINISHED TO A SMOOTH SURFACE OF UNIFORM BEARING VALUE OR AS DIRECTED BY THE ENGINEER.
4. ALL REINFORCING TO BE LOCATED ON CHAIRS.
5. ALL EDGES OF KERBS AND DISH CROSSINGS TO BE SHAPED WITH AN EDGING TOOL (25mm RADIUS).
6. MASTIC JOINTS 10mm WIDE TO BE PLACED NO MORE THAN 6.0m AND NOT LESS THAN 4.0m INTERVALS OR AS OTHERWISE STATED.
7. DRIVEWAYS TO BE BRUSHED FINISH IN DIRECTION AS SHOWN AND AN EDGING TOOL 50mm WIDE 5mm RAD. APPLY IN ALL JOINTS & EDGES.



DRIVEWAY TYPE	SLAB THICKNESS & REINFORCEMENT
RESIDENTIAL	100mm, F72 (1) LAYER 45 B COVER
RESIDENTIAL H.D.	150mm, F82 (1) LAYER 60 B COVER
COMMERCIAL	200mm, F82 (2) LAYERS 50 T&B COVER
INDUSTRIAL	250mm, F82 (2) LAYERS 60 T & B COVER

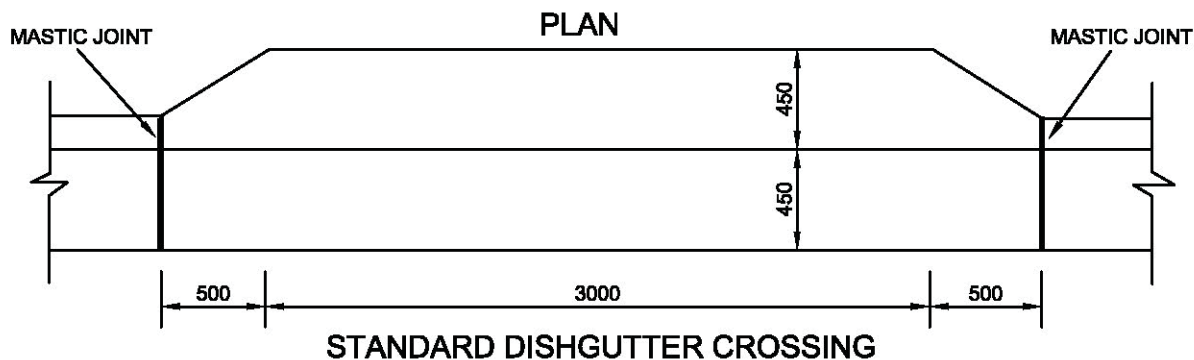
DRAWN BY	NMcFall	CHECKED	J Ingegneri
DESIGNED	NMcFall	APPROVED	M Shaw
DATE	28/01/10	ENGINEER	

CITY OF RANDWICK

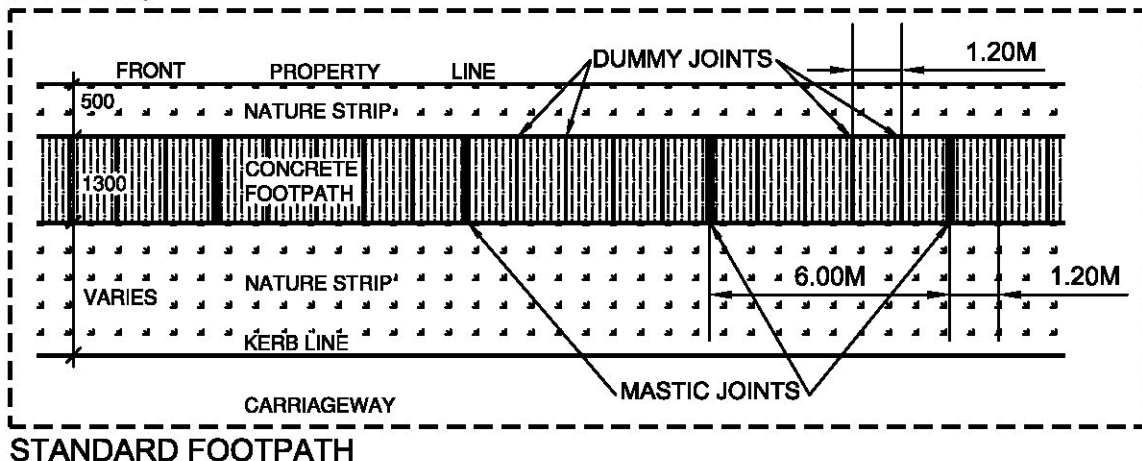
STANDARD KERB & GUTTER AND VEHICULAR CROSSING

SCALE:
NTS

PLAN No.
SD4

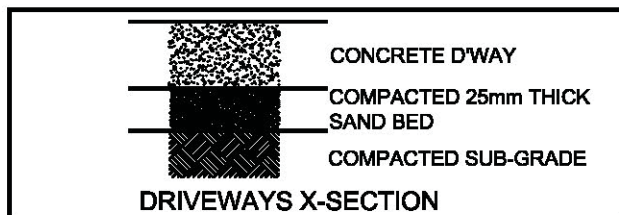
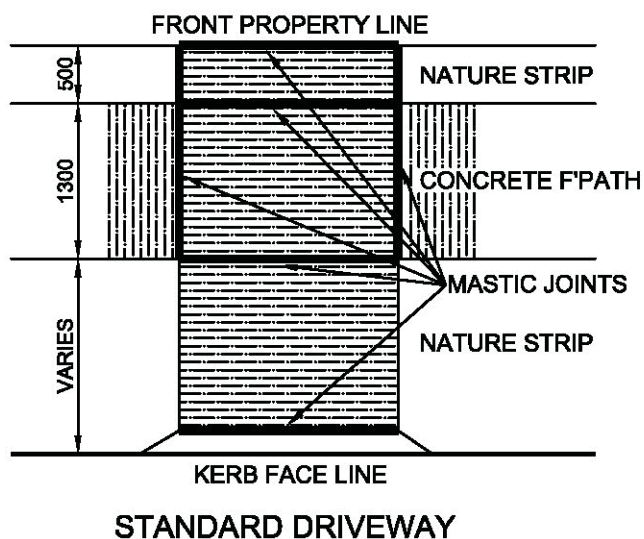


PLAN NTS



NOTES:

1. COMPRESSIVE STRENGTH OF CONCRETE TO BE 32 MPa AT 28 DAYS.
2. FOOTPATHS AND DRIVEWAYS SUB-GRADE AND SAND BED COURSE TO BE THOROUGHLY COMPACTED WITH MECHANICAL HAND HELD COMPACTORS AND FINISH TO A SMOOTH SURFACE OF UNIFORM BEARING VALUE OR AS DIRECTED BY THE ENGINEER.
3. CONCRETE TO BE POURED ON A COMPACTED 25mm THICK LAYER OF BEDDING SAND.
4. A MASTIC JOINT 10MM WIDE IS TO BE PLACED EVERY 6.0m AND A DUMMY JOINT PLACED EVERY 1.2m.
5. X-FALL FROM BACK OF PATH TO FRONT OF PATH TO BE 2.5% OR 32.5mm for 1.3m WIDE PATH OR AS SPECIFIED BY THE ENGINEER.
6. ALL REINFORCING TO BE LOCATED ON CHAIRS.
7. FOOTPATH AND DRIVEWAYS TO BE BRUSHED FINISH IN DIRECTION AS SHOWN AND ALL EDGES OF FOOTPATH AND DISH CROSSINGS TO BE SHAPED WITH AN EDGING TOOL 50mm WIDE 5mm RAD. APPLY IN ALL JOINTS & EDGES.
8. THE NATURE STRIP UPON COUNCIL'S FOOTWAY OF THE PROPOSED CONSTRUCTION WORKS SHALL BE BACKFILLED WITH TOPSOIL EQUIVALENT WITH 'ORGANIC GARDEN MIX' AS SUPPLIED BY AUSTRALIAN NATIVE LANDSCAPES.
9. FOOTPATH TO BE 100mm THICK AND REINFORCED AT VEHICULAR CROSSINGS AS IN RCC VEHICULAR ACCESS STRENGTHS TABLE BELOW.



R.C.C. TABLE-VEHICULAR ACCESS STRENGTHS

DRIVEWAY TYPE	SLAB THICKNESS & REINFORCEMENT
RESIDENTIAL	100mm, F72 (1) LAYER 45 B COVER
RESIDENTIAL H.D.	150mm, F82 (1) LAYER 60 B COVER
H.D.-HEAVY DUTY-MORE THAN ONE PROPERTY USING DRIVEWAY.	
COMMERCIAL	200mm, F82 (2) LAYERS 50 T&B COVER
INDUSTRIAL	250mm, F82 (2) LAYERS 60 T&B COVER

DRAWN BY **GPanda**

CHECKED **N McFall**

DESIGNED **GPanda**

APPROVED
ENGINEER **MShaw**

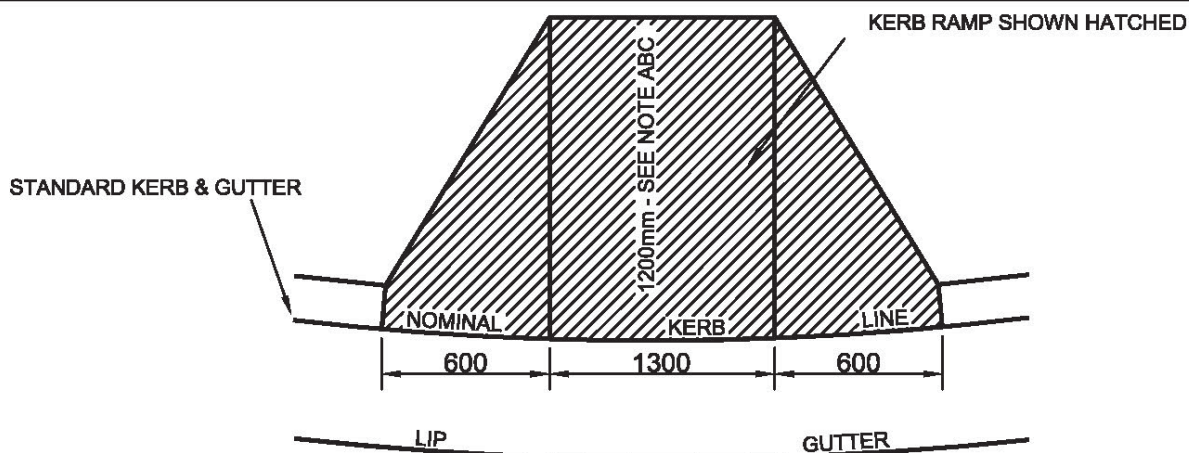
DATE **14/07/2005**

CITY OF RANDWICK

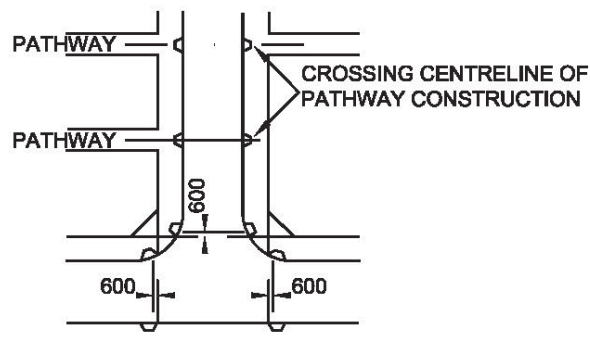
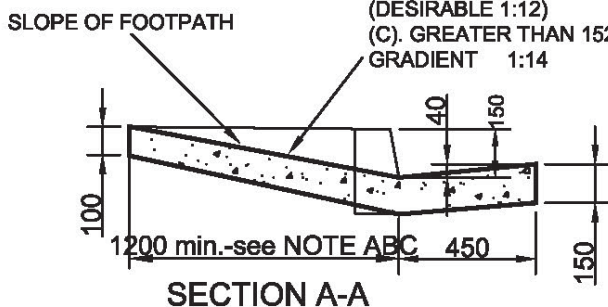
**STANDARD FOOTPATH AND
VEHICULAR CROSSING**

SCALE:
NTS

PLAN No.
SD4a



- (A). MIN. LENGTH SHALL BE 1200mm
 (B). LESS THAN 1520mm LENGTH - MAX GRADIENT 1:8
 (DESIRABLE 1:12)
 (C). GREATER THAN 1520mm IN LENGTH - MAX.
 GRADIENT 1:14

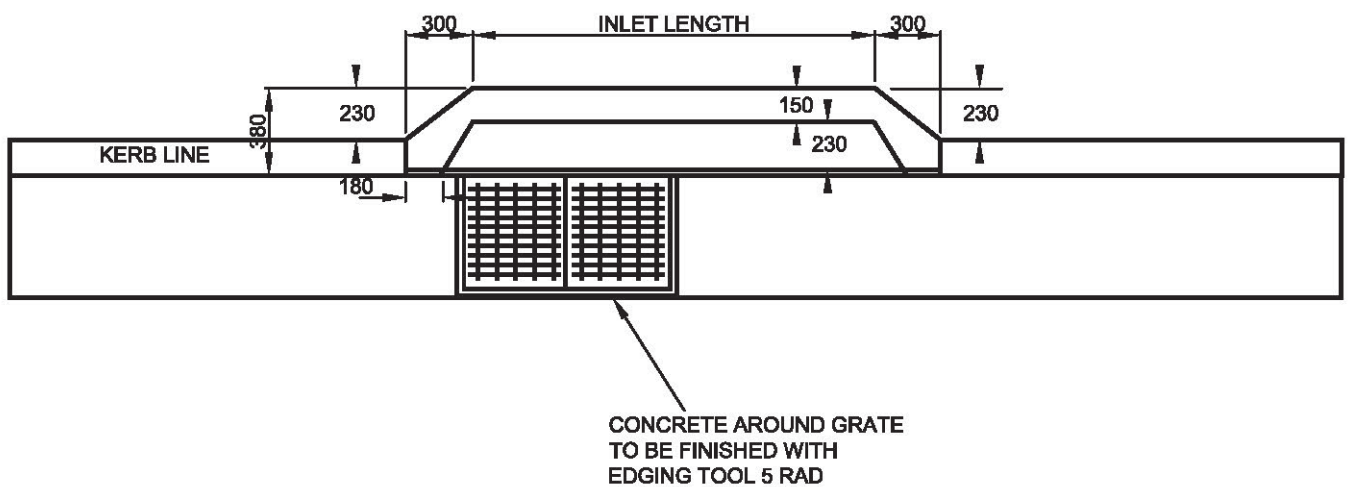
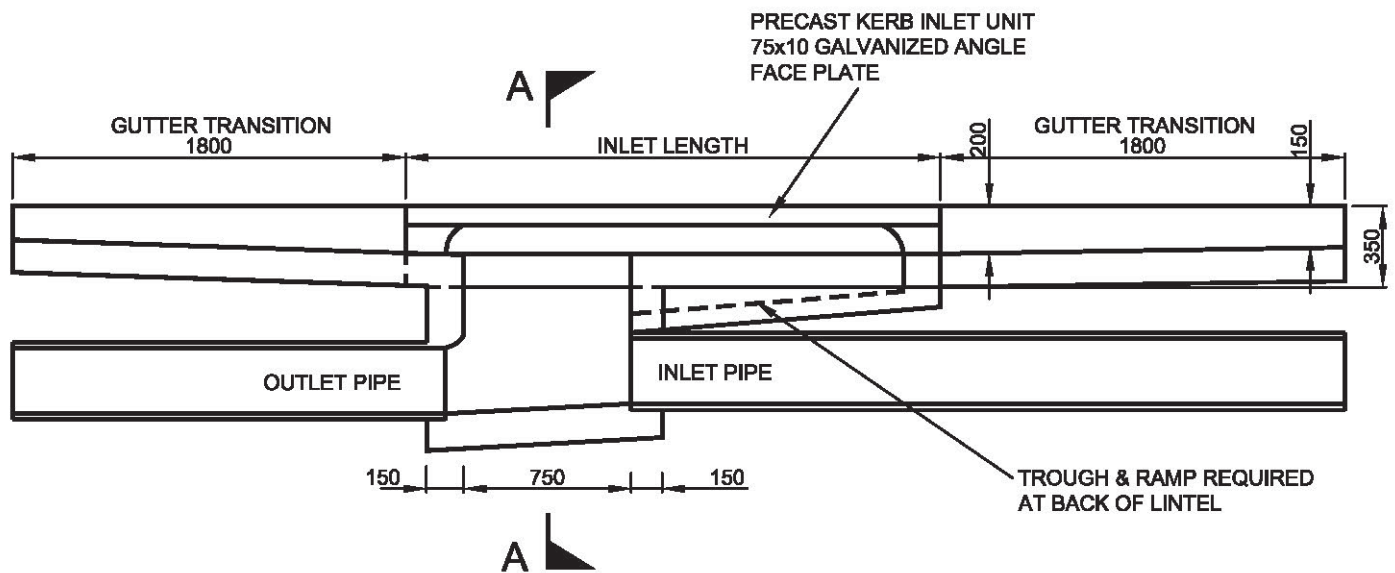


PLAN SHOWING KERB RAMP CROSSINGS

NOTES:

1. KERB RAMPS SHOULD BE PROVIDED AT APPROVED SITES ON CORNERS OF STREET INTERSECTIONS AND AT ESTABLISHED PEDESTRIAN CROSSINGS BETWEEN STREET INTERSECTIONS.
2. THE NUMBER AND POSITIONS OF RAMPS IS TO BE DETERMINED AFTER CONSIDERATION OF THE GENERAL MOVEMENT OF PEDESTRIANS. THE LOCATION OF MARKED FOOT CROSSINGS, AND THE POSITION OF ANY EXISTING OBSTACLES SUCH AS TRAFFIC SIGNALS, GULLY PITS, ETC. THE LOCATION OF KERB RAMPS SHOULD BE CAREFULLY PLANNED TO ENSURE THAT USERS ARE NOT PUT AT RISK FROM TRAFFIC OF ANY KIND, BEARING IN MIND THAT THE DISABLED PERSON'S REACTION TIME MAY BE GREATER THAN THAT OF PERSONS HAVING FULL MOBILITY.
3. KERB RAMPS SHOULD BE INSTALLED IN THE KERB IN A MANNER WHICH WILL DIRECT THE USER ACROSS THE ADJACENT ROADWAY BY THE MOST DIRECT ROUTE.
4. KERB RAMPS TO BE LAID ON WELL COMPACTED FINE CRUSHED ROCK BASE MINIMUM THICKNESS 50mm.
5. CONCRETE TO BE OF 32MPa COMPRESSIVE STRENGTH AT 28 DAYS.

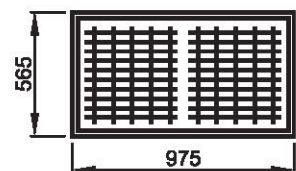
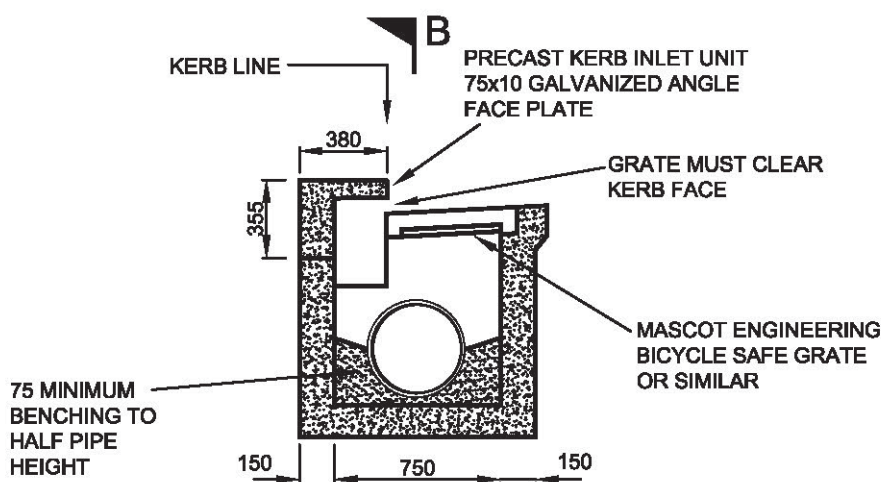
DRAWN BY	NMcFall	CHECKED	S Audet	CITY OF RANDWICK	SCALE:
DESIGNED	NMcFall	APPROVED ENGINEER	J Ingegneri	STANDARD KERB RAMP CROSSINGS	NTS
DATE	28/01/14				PLAN No.
					SD5



STANDARD DOUBLE GRATED GULLY PIT

FOR PIPES UP TO 600mm DIAMETER

NOTES:
ALL CONCRETE TO BE 32MPa
COMPRESSIVE STRENGTH AT 28 DAYS



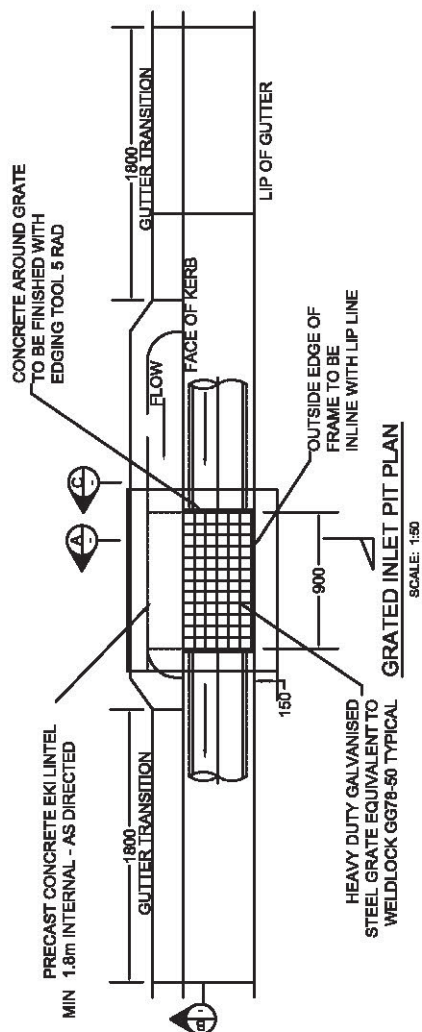
STANDARD BICYCLE SAFE GRATE

WELDLCK (PRODUCT No. GG78.49) GRATE & FRAME

DRAWN BY	NMcFall	CHECKED	J Ingegneri	CITY OF RANDWICK	SCALE:
DESIGNED	NMcFall	APPROVED	M Shaw		NTS
DATE	28/01/10	ENGINEER			PLAN No.
STANDARD DOUBLE GRATED GULLY PIT & FRAME					SD6

NOTES:

1. COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS TO BE 32MPa.
2. TOP OF BENCHING TO BE MINIMUM @ OBVERT OUTLET PIPE.
3. 100 DIA. SUBSOIL DRAINAGE PIPE 3m LONG WRAPPED IN FABRIC SOCK TO BE PROVIDED IN PIPE TRENCHES ADJACENT TO INLET PIPES.
4. PROVIDE STEP IRONS WHERE PIT IS DEEPER THAN 1.0m AT 450 CENTRES.
5. PITS OVER 1.5m IN DEPTH TO BE REINFORCED WITH F82 MESH RETURNED 300mm INTO BASE WITH WALLS 200mm THICK.
6. PITS OVER 2.4m IN DEPTH TO BE DESIGNED BY STRUCTURAL ENGINEER.



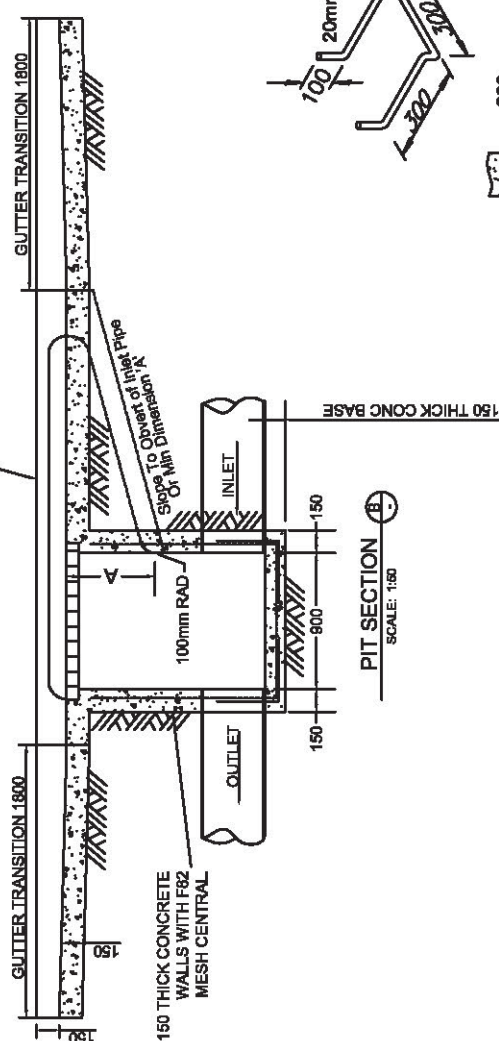
GRADED INLET PIT PLAN

SCALE: 1:50

WELDLICK GRATE SET PARALLEL & ADJACENT TO GUTTER & 10 LOWER MUST CLEAR KERB FACE

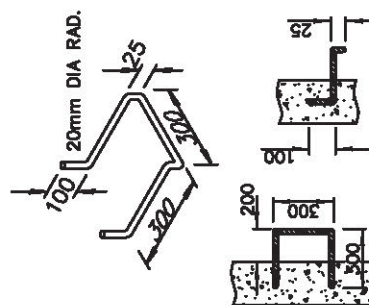
REINSTATE ROAD TO MATCH EXISTING - OVER DGB20 COMPACTED TO 98% STANDARD DENSITY.

PRECAST CONCRETE EKI LINTEL WITH FLAT GAL. FACE PLATE LENGTH MIN 1.8m INTERNAL - AS DIRECTED



PIT SECTION A

SCALE: 1:50



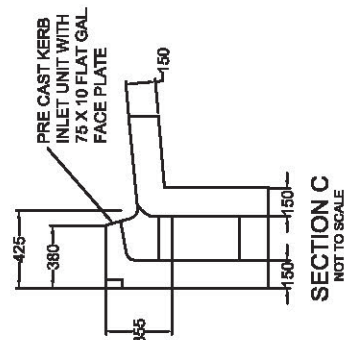
STEP IRON DETAIL

STEP IRON OF 20mm GALVANIZED STEEL MADE TO SHAPE AND DIMENSIONS SHOWN AND PLACED AT 450 CENTRES AND STAGGERED HORIZONTALLY FOR PITS DEEPER THAN 1.0m.

MIN DIMENSION A (mm)	INLET LENGTH (m)
250	1.8
300	2.4
400	3.0
450	3.6
500	4.2

PIT SECTION A

NOT TO SCALE



SECTION C

NOT TO SCALE

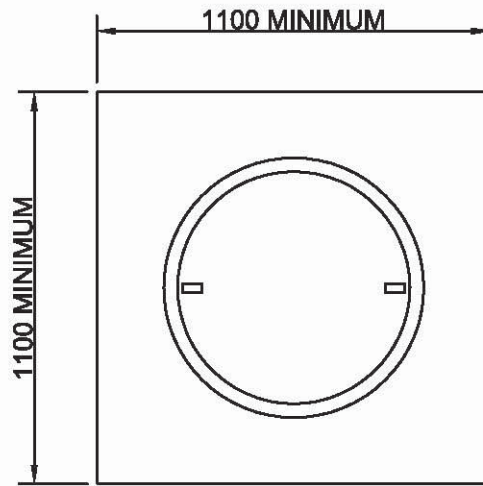
DRAWN BY MLeong
DESIGNED NMcFall
DATE 28/01/10

CHECKED J Ingegneri
APPROVED ENGINEER M Shaw

CITY OF RANDWICK
STANDARD DGGP WITH
EXTENDED KERB INLET

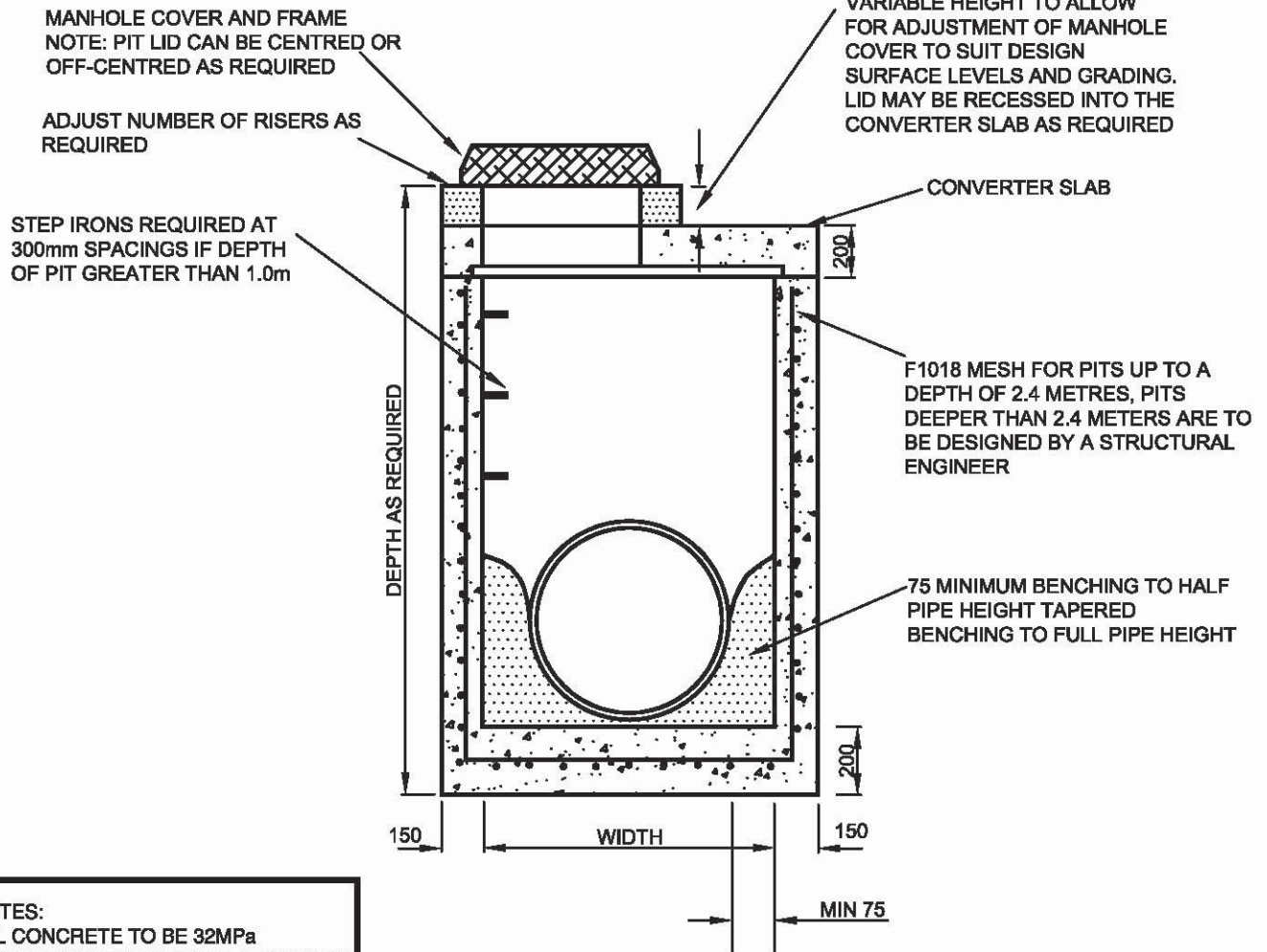
SCALE:
NTS
PLAN No.
SD7

MANHOLE COVER AND FRAME



DURHAM 600MM DIAMETER
STORMWATER MANHOLE (CLASS D) IN
CONVERTER SLAB, MANHOLE TYPE
DEPENDANT ON PIT LOCATION:

1. FOR LOW TRAFFIC ROADS WITH 60
KM/H OR LESS, FOOTPATHS, PARKS
AND PARKING LANES USE SW 60 DS
PIT LIDS
OR
2. FOR HIGH TRAFFIC ROADS OR
ROADS WITH SPEED LIMITS GREATER
THAN 60 KM/H USE SW 60 DI LIDS



NOTES:
ALL CONCRETE TO BE 32MPa
COMPRESSIVE STRENGTH AT 28 DAYS

STANDARD JUNCTION PIT

MINIMUM DIMENSIONS OF PIT

Ø OF OUTLET ON STRAIGHT	WIDTH	LENGTH	Ø OF OUTLET ON STRAIGHT	WIDTH	LENGTH
UP TO 750	900	900	1350	1500	1200
825/900	1200	1200	1500	1650	1200
1050	1200	1200	1650	1800	1200
1200	1350	1200	1800	1950	1200

DRAWN BY **GELKAZZI**

CHECKED **J Ingegneri**

DESIGNED **PTATHAM**

APPROVED
ENGINEER **M Shaw**

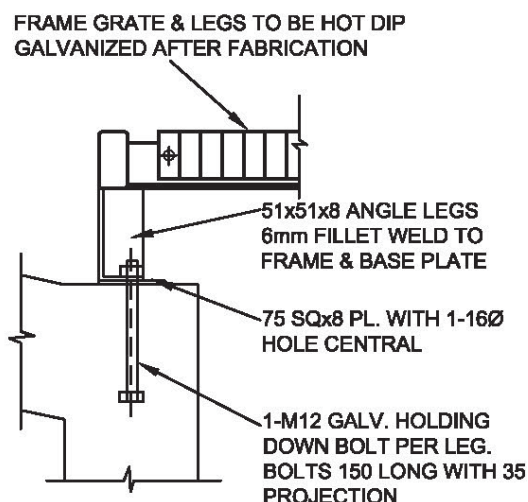
DATE **28/01/10**

CITY OF RANDWICK

**STANDARD MANHOLE COVER &
FRAME**

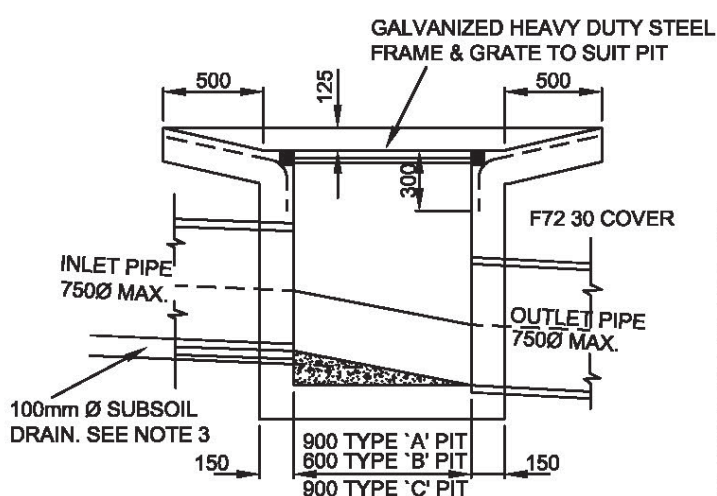
SCALE:
NTS

PLAN No.
SD8



SECTION A-A
INLET PIT TYPE A

DETAIL 'X'

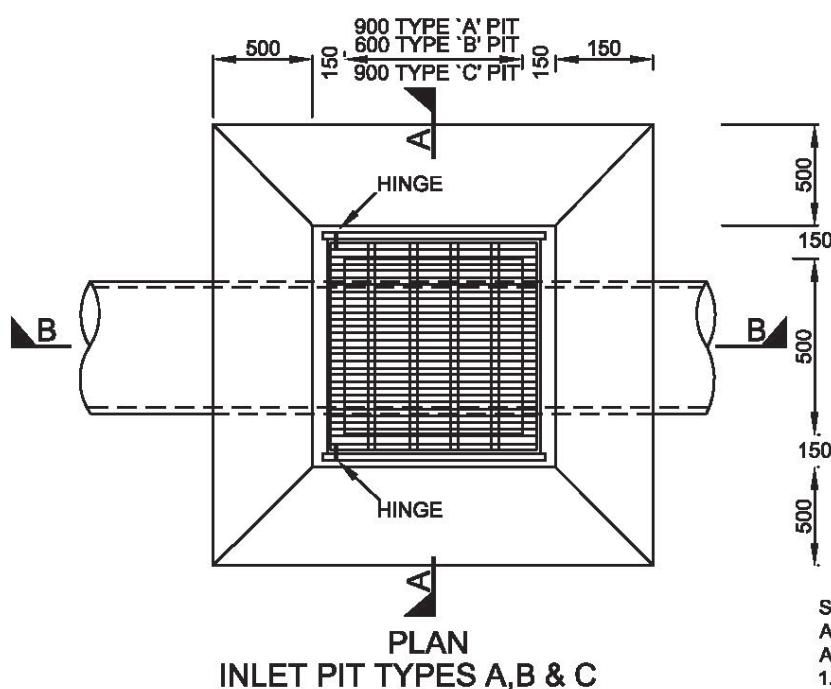


SECTION B-B

INLET PIT TYPES B & C

PIT	OPENING SIZE
TYPE A	900x900
TYPE B	600x900
TYPE C	900x900

1. COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS TO BE 32MPa.
2. TOP OF BENCHING TO BE 1/2 OF OUTLET PIPE DIAMETER.
3. 100mm DIA. SUBSOIL DRAINAGE PIPE 3m LONG WRAPPED IN FABRIC SOCK TO BE PROVIDED IN PIPE TRENCHES ADJACENT TO INLET PIPES.
4. PROVIDE STEP IRONS WHERE PIT IS DEEPER THAN 1.0m AT 300mm CENTRES.
5. PITS OVER 1.5m IN DEPTH TO BE REINFORCED WITH F82 MESH RETURNED 300mm INTO BASE WITH WALLS 200mm THICK.
6. PITS DEEPER THAN 2.4m TO BE DESIGNED BY A STRUCTURAL ENGINEER.



STEP IRON DETAIL

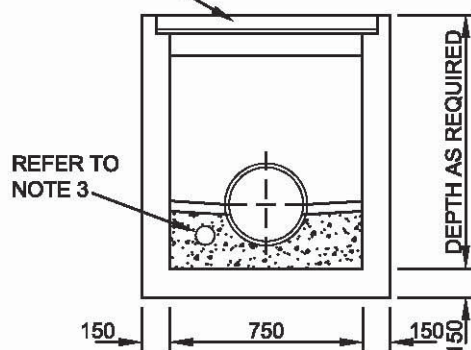
STEP IRON OF 20mm GALVANIZED STEEL MADE TO SHAPE AND DIMENSIONS SHOWN AND PLACED AT 300 CENTRES AND STAGGERED HORIZONTALLY FOR PITS DEEPER THAN 1.0m.

DRAWN BY	NMcFall	CHECKED	J Ingegneri	CITY OF RANDWICK STANDARD SURCHARGE PIT	SCALE:
DESIGNED	NMcFall	APPROVED	M Shaw		NTS
DATE	02/03/10	ENGINEER			PLAN No.
					SD9

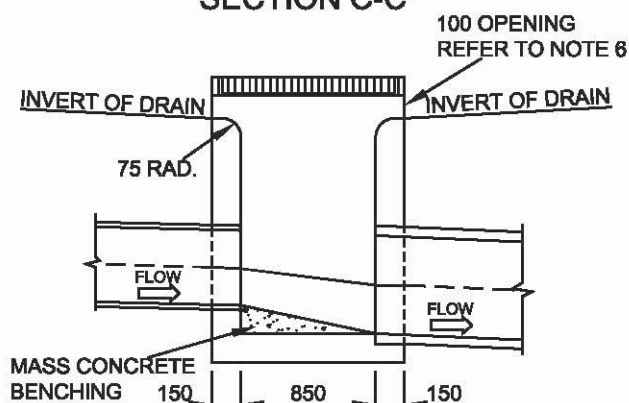
MAXIMUM PIPE SIZES - TYPE A PIT

INLET/OUTLET PIPE ON STRAIGHT	- 825Ø
INLET/OUTLET PIPE AT 45° SKEW	- 525Ø
SIDE ENTRY/OUTLET PIPE ON STRAIGHT	- 600Ø
SIDE ENTRY/OUTLET PIPE AT 45° SKEW	- 375Ø

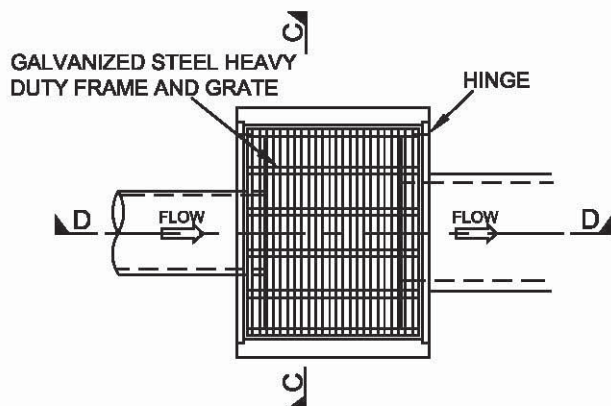
GALVANIZED STEEL HEAVY DUTY FRAME AND GRATE



SECTION C-C



SECTION D-D



PLAN
SURFACE INLET PIT TYPE A

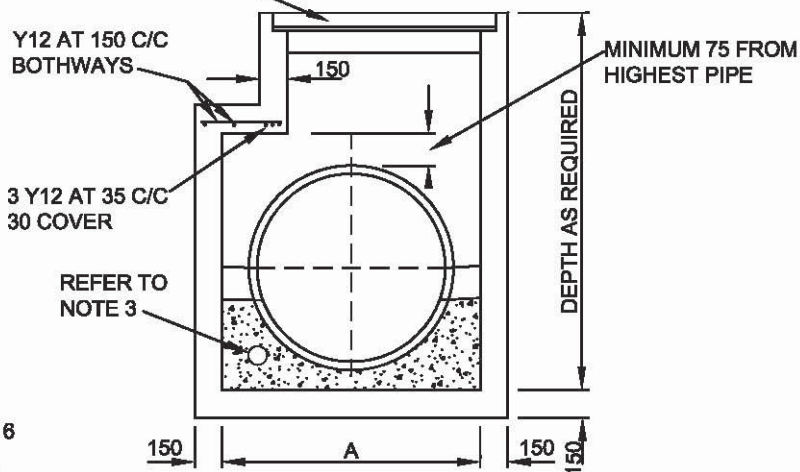
NOTES

1. COMPRESSIVE STRENGTH OF CONCRETE AT 28 DAYS TO BE 32MPa.
2. TOP OF BENCHING TO BE 1/2 OF OUTLET PIPE DIAMETER.
3. 100 DIA. SUBSOIL DRAINAGE PIPE 3.0m LONG WRAPPED IN FABRIC SOCK TO BE PROVIDED AT INVERT LEVEL EITHER SIDE OF INLET PIPES.
4. PROVIDE STEP IRONS WHERE PIT IS DEEPER THAN 1.0m AT 300mm CENTRES.
5. PITS OVER 1.5m IN DEPTH TO BE REINFORCED WITH F82 MESH RETURNED 300mm INTO BASE WITH WALLS 200mm THICK.
6. WHERE INLET OPENING GREATER THAN 100mm IS REQUIRED A R20 DIA. GALVANIZED BAR SHALL BE PLACED HORIZONTALLY ACROSS THE OPENING AT MID HEIGHT.

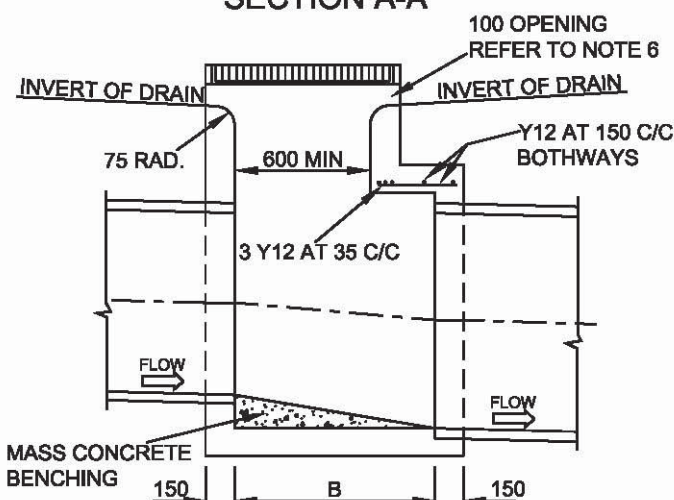
MAXIMUM PIPE SIZES - TYPE B PIT

INLET/OUTLET PIPE ON STRAIGHT	- 1800Ø
INLET/OUTLET PIPE AT 45° SKEW	- 1200Ø
SIDE ENTRY/OUTLET PIPE ON STRAIGHT	- 1050Ø
SIDE ENTRY/OUTLET PIPE AT 45° SKEW	- 750Ø

GALVANIZED STEEL HEAVY DUTY FRAME AND GRATE

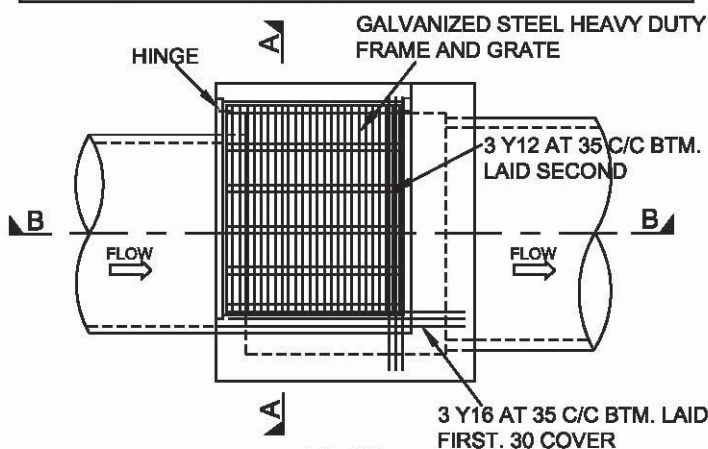


SECTION A-A



SECTION B-B

Ø OF OUTLET ON STRAIGHT	A	B	Ø OF OUTLET ON STRAIGHT	A	B
900	1050	900	1500	1850	1200
1050	1200	900	1650	1800	1200
1200	1350	900	1800	1950	1200
1350	1500	1050			



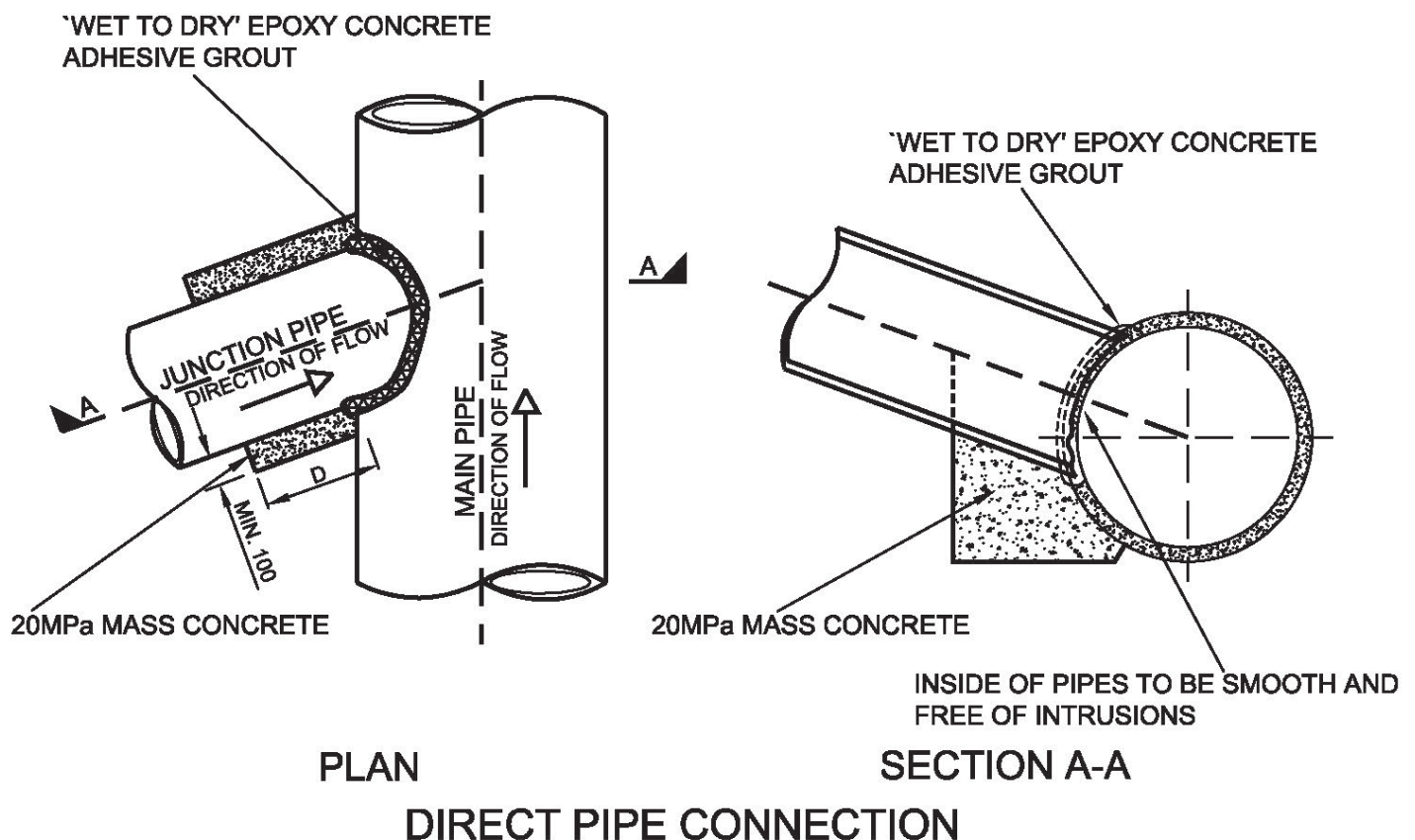
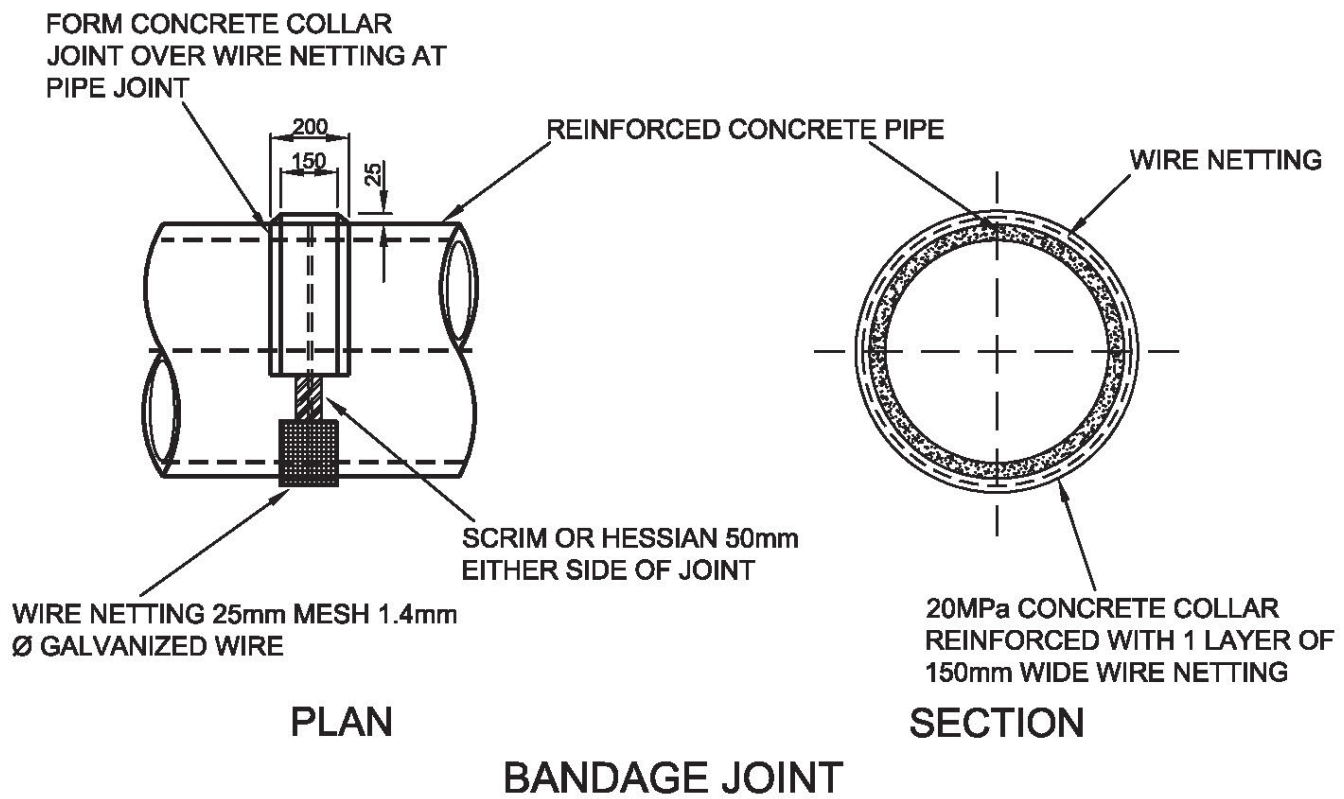
PLAN
SURFACE INLET PIT TYPE B

DRAWN BY **NMcFall**
DESIGNED **NMcFall**
DATE **28/01/10**

CHECKED **J Ingegneri**
APPROVED ENGINEER **M Shaw**

CITY OF RANDWICK
STANDARD SURFACE INLET PITS

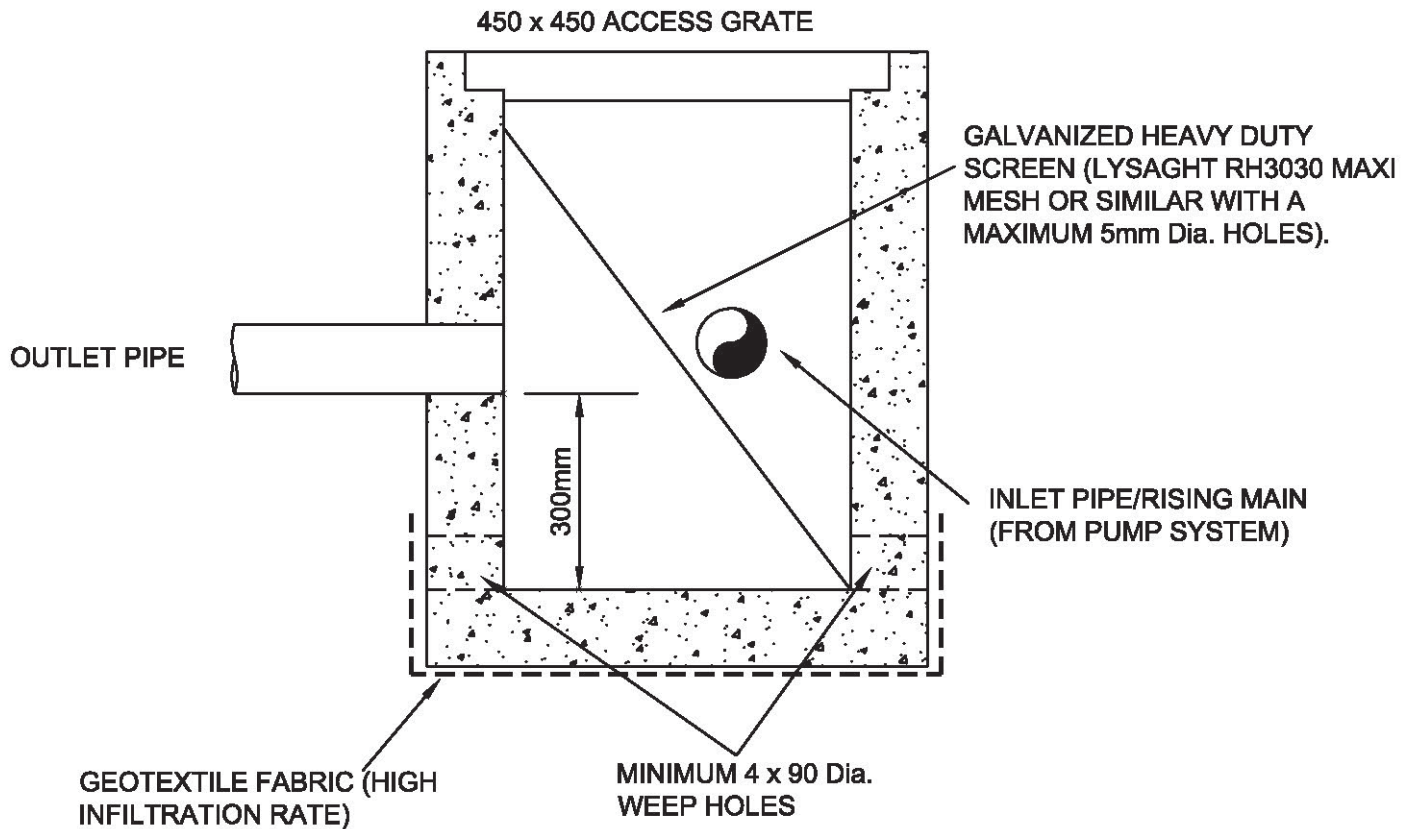
SCALE:
NTS
PLAN No.
SD10



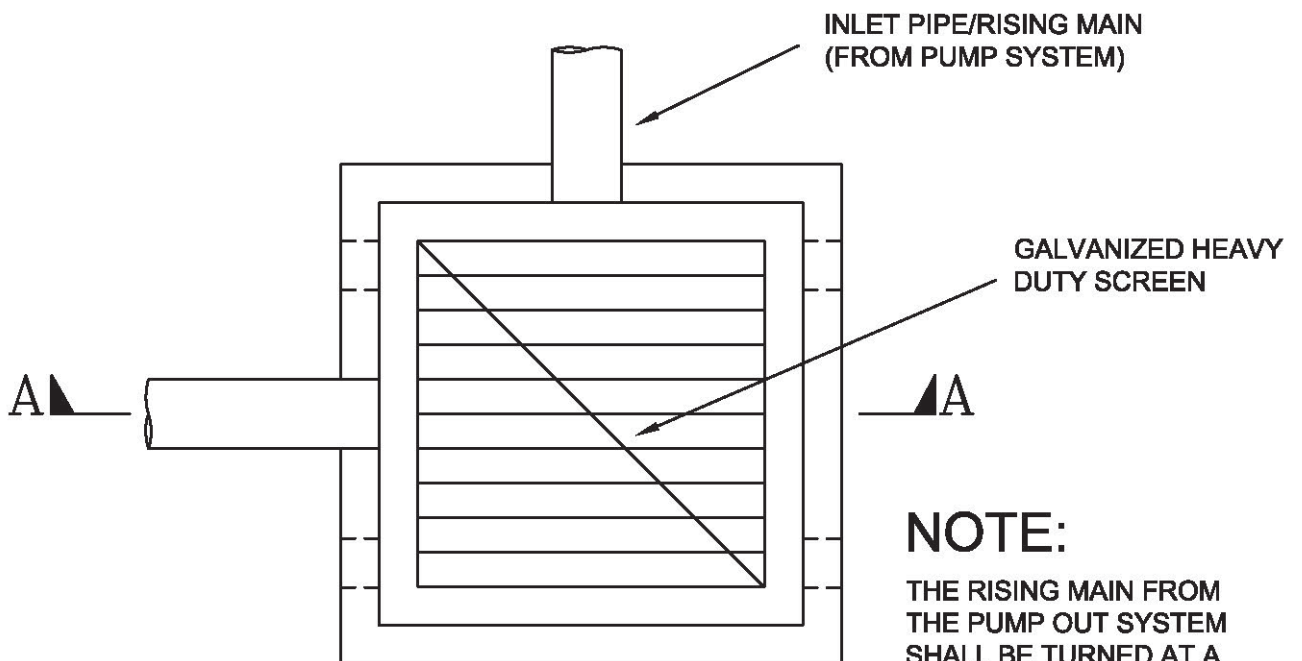
NOTES:

1. IMMEDIATELY PRIOR TO APPLICATION OF CONCRETE, AFFECTED SURFACES TO BE PAINTED WITH 'WET TO DRY' EPOXY.

DRAWN BY	NMcFall	CHECKED	J Ingegneri	CITY OF RANDWICK BANDAGE JOINTS & CONNECTION DETAILS	SCALE: NTS
DESIGNED	NMcFall	APPROVED			PLAN No.
DATE	28/01/10	ENGINEER	M Shaw		SD11



SECTION A-A



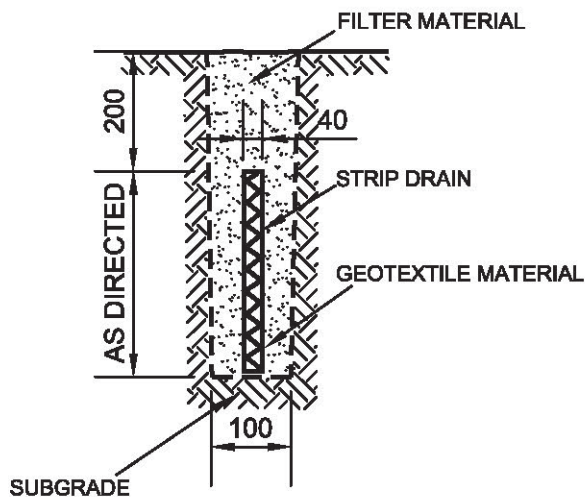
PLAN

NOTE:

THE RISING MAIN FROM THE PUMP OUT SYSTEM SHALL BE TURNED AT A 90° ANGLE AT THE STILLING PIT.

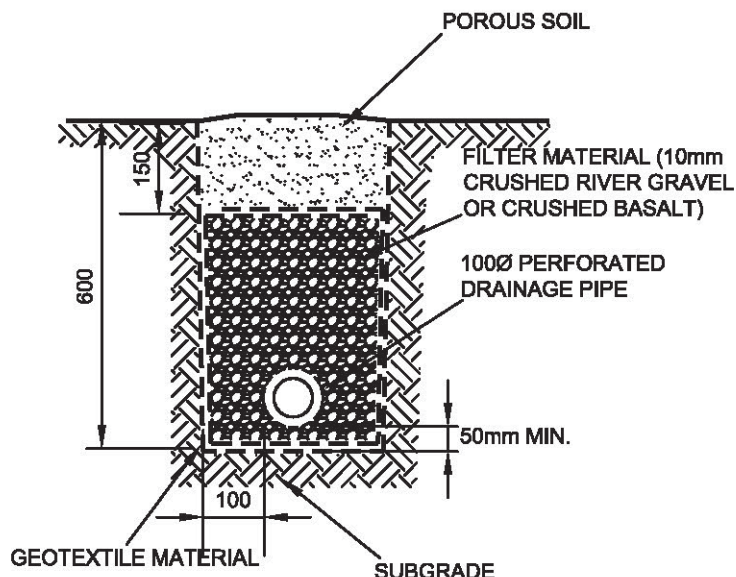
ALL CONCRETE TO BE NOT LESS THAN 20MPa COMPRESSIVE STRENGTH AT 28 DAYS

DRAWN BY	NMcFall	CHECKED	J Ingegneri	CITY OF RANDWICK	SCALE:
DESIGNED	NMcFall	APPROVED	M Shaw		NTS
DATE	28/01/10	ENGINEER		STANDARD ARRESTOR PIT AND STILLING PIT	PLAN No.
					SD12

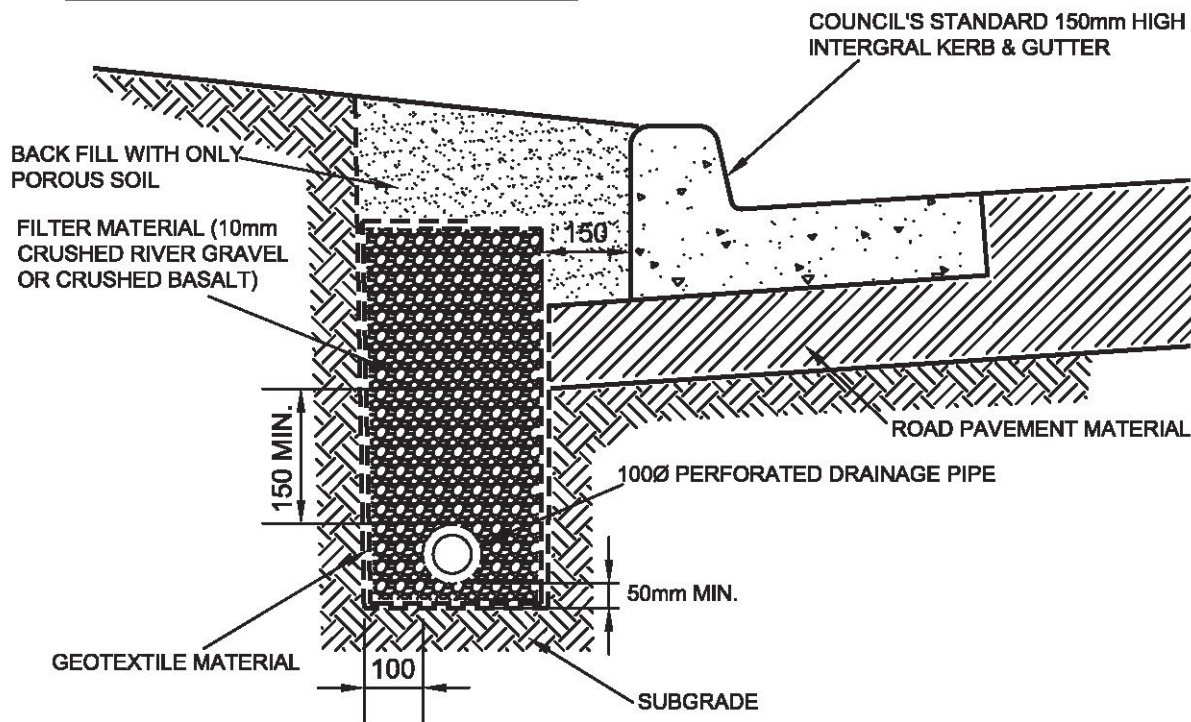


STRIP DRAIN
(SAND AS FILTER MATERIAL)

SAND FILTER MATERIAL GRADING	
AS. SIEVE SIZE mm	% PASSING
4.750	100
2.360	95-100
0.425	20-80
0.300	0-30
0.150	0-2
0.075	0-0.1



TYPICAL INSTALLATION



TYPICAL INSTALLATION WITH KERB & GUTTER

NOTES:

1. THE MINIMUM GRADE OF THE LINE TO BE 1 IN 200. THE GRADE SHALL FALL CONTINUOUSLY TO PREVENT SILTING UP AND BLOCKAGES.
2. TRENCHES SHOULD HAVE CLEARLY CUT SIDES TO AVOID CONTAMINATION OF THE FILTER DURING CONSTRUCTION.
3. ENSURE THAT THE PIPE IS LOCATED WITH ONLY POROUS SOIL ABOVE. AVOID HEAVY CLAY BACK FILL WHICH RESTRICTS THE FLOW OF WATER TO THE PIPE.
4. ENSURE THAT AN APPROPRIATE FILTER MATERIAL IS USED. A MAXIMUM FILTER SIZE OF 10mm TO BE USED TO AVOID PUNCTURING THE PIPE.
5. A MINIMUM 50mm LAYER OF FILTER MATERIAL TO BE FIRST PLACED IN THE TRENCH TO PROVIDE A DRAINAGE PATH UNDERNEATH THE PLASTIC PIPE.
6. THE PIPE IS TO BE KEPT IN THE CENTRE OF THE TRENCH AND THE FILTER MATERIAL COMPACTED UNDER THE HAUNCHES, AROUND THE SIDES AND ABOVE THE PIPE.

DRAWN BY **NMcFall**

CHECKED **J Ingegneri**

CITY OF RANDWICK

SCALE:
NTS

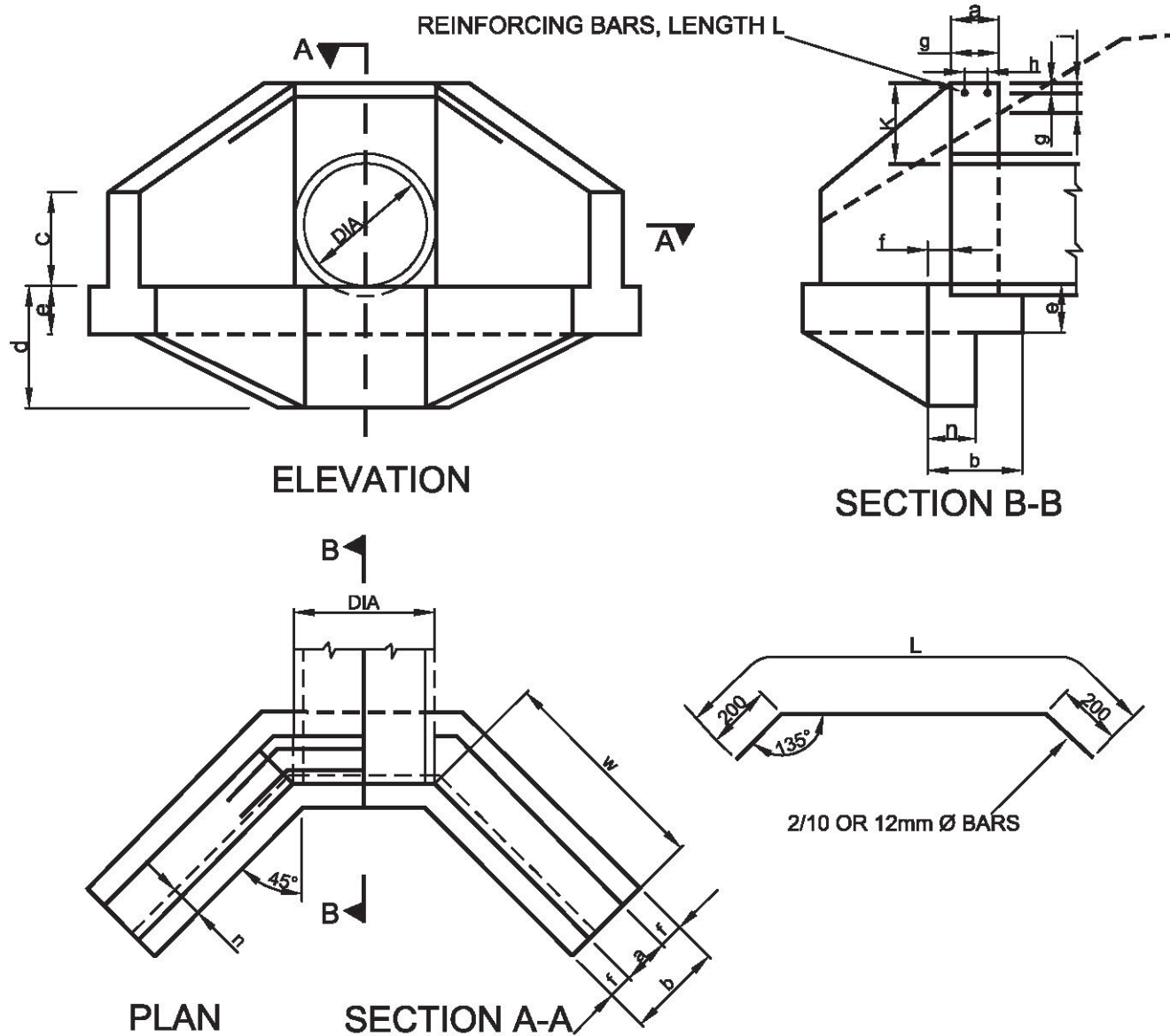
DESIGNED **NMcFall**

APPROVED
ENGINEER **M Shaw**

SUBSOIL DRAINS

PLAN No.
SD14

DATE **28/01/10**



NOTES:

1. ALL QUANTITIES ARE FOR ONE HEADWALL ONLY.
2. ALL EXPOSED SURFACES TO HAVE 12mm CHAMFER.
3. REINFORCING BARS TO BE STRUCTURAL GRADE DEFORMED.
4. CONCRETE COMPRESSIVE STRENGTH (F'c) 20MPa AT 28 DAYS.

PIPE DIAMETER. Ø	375	450	525	600	675	750	825	900
a	150	150	150	180	190	205	215	230
b	300	300	300	450	450	450	450	450
c	300	300	300	380	380	380	380	380
d	380	380	380	530	530	530	530	530
e	150	150	150	180	190	205	215	230
f	75	75	75	110	110	110	110	110
g	40	40	40	50	50	50	50	50
h	70	70	70	80	90	105	115	130
j	100	100	100	100	100	100	100	100
k	230	230	230	300	300	300	300	300
n	150	150	150	150	150	150	150	150
w	690	840	990	1120	1285	1450	1615	1780
L	840	915	950	1100	1200	1250	1350	1400
REINFORCEMENT Ø DIA.	10	10	10	12	12	12	12	12
REINFORCEMENT LENGTH	1680	1830	1845	2200	2400	2500	2700	2800
REINFORCEMENT, Kg. MASS	1.10	1.20	1.30	2.00	2.30	2.60	2.78	2.95
VOLUME OF CONCRETE CM	0.27	0.33	0.38	0.67	0.85	1.02	1.21	1.40

DRAWN BY NMcfall

CHECKED J Ingegneri

CITY OF RANDWICK

SCALE:
NTS

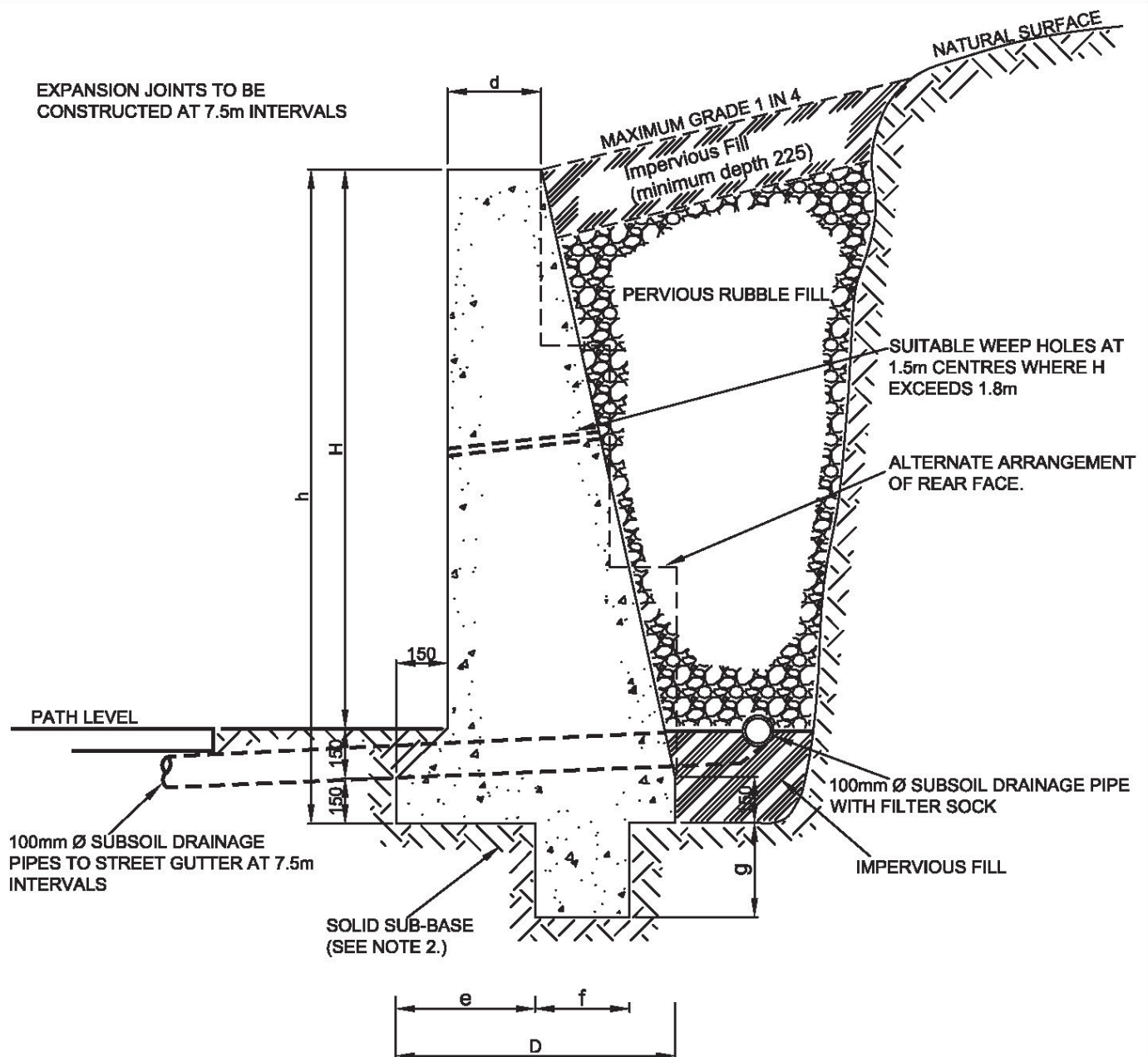
DESIGNED NMcfall

APPROVED
ENGINEER M Shaw

STANDARD CONCRETE
HEADWALLS

PLAN No.
SD15

DATE 28/01/10

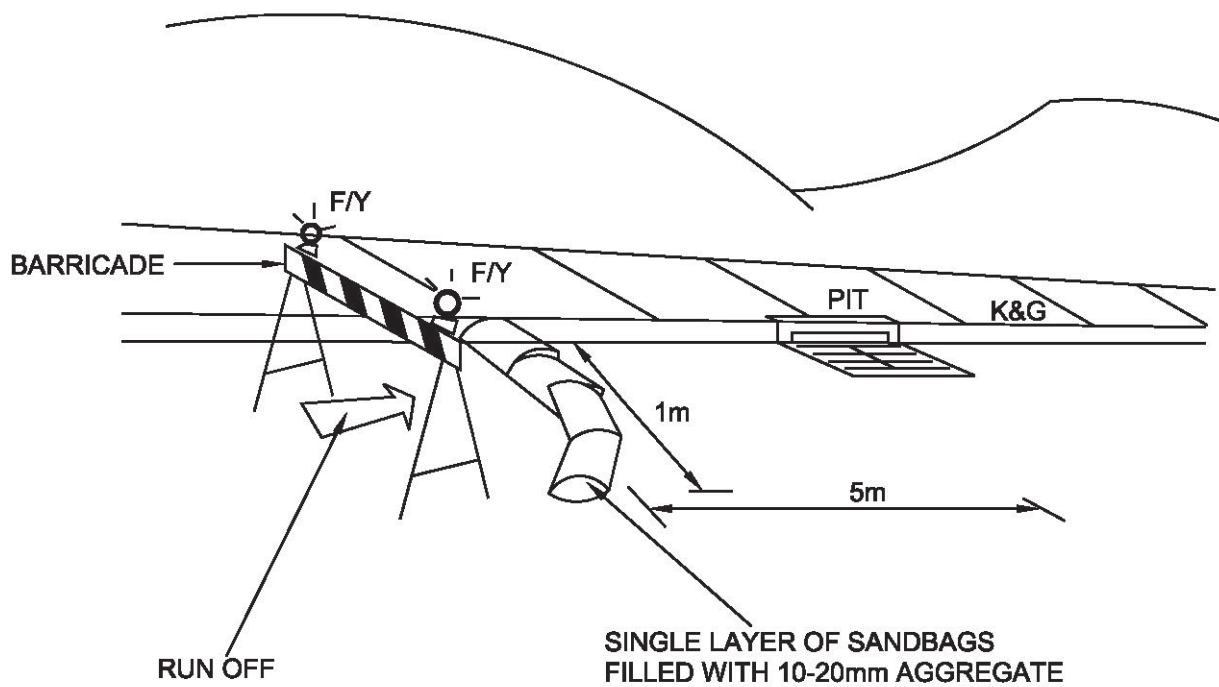


CONCRETE RETAINING WALL DIMENSIONS							
H	h	D	d	e	f	g	CM/M. RUN (APPROX.)
900	1200	600	150	-	-	-	0.50
1050	1350	675	150	-	-	-	0.60
1200	1500	675	225	-	-	-	0.73
1350	1650	725	225	-	-	-	0.83
1500	1800	750	225	300	225	225	1.00
1650	1950	800	225	375	225	225	1.15
1800	2100	900	300	450	300	300	1.48
2100	2400	1050	300	450	300	300	1.86
2400	2700	1200	300	450	300	300	2.28
2700	3000	1350	300	450	300	300	2.76

NOTES:

1. THIS PLAN IS THE MINIMUM REQUIREMENT OF COUNCIL AND NO RESPONSIBILITY IS ACCEPTED FOR THE STABILITY OF RETAINING WALL.
2. IF THE WALL RESTS ON SILT OR SOFT CLAY IMMEDIATELY BEFORE FORMING THE FOOTING, A 100mm OF SOIL IS TO BE REMOVED AND REPLACED WITH 100mm OF WELL COMPACTED GRANULAR MATERIAL.

DRAWN BY NMcfall	CHECKED	CITY OF RANDWICK STANDARD MASS CONCRETE RETAINING WALL	SCALE: NTS
DESIGNED NMcfall	APPROVED		PLAN No.
DATE 9/3/01	ENGINEER J FRANGOPLES		SD16



DRAWN BY NMcfail

CHECKED FRotta

DESIGNED NMcfail

APPROVED
ENGINEER MSavage

DATE 9/3/01

CITY OF RANDWICK

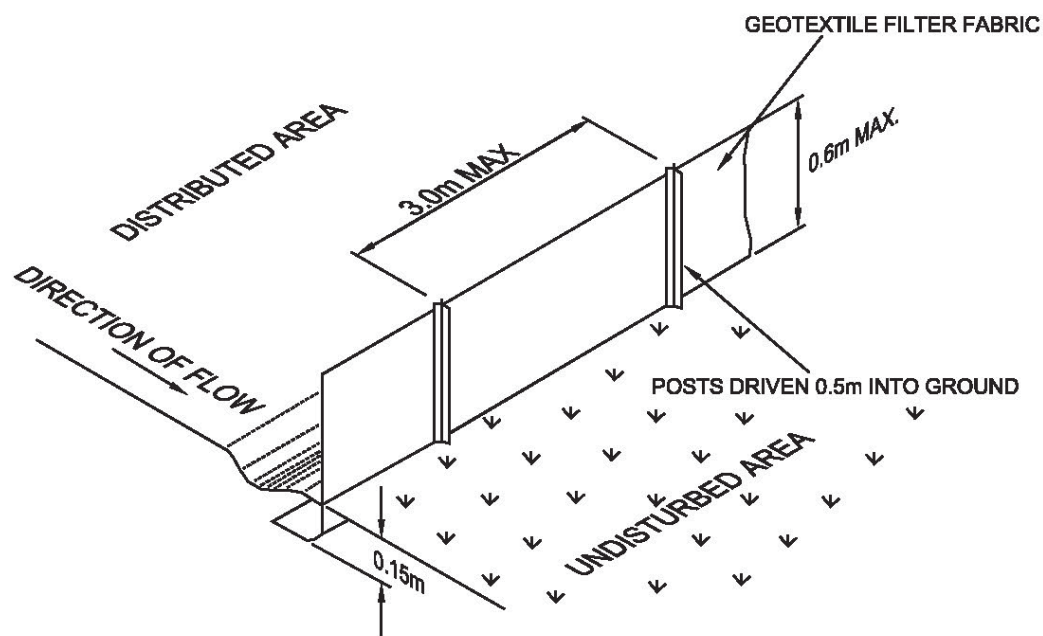
STANDARD SANDBAG KERB
SEDIMENT TRAP

SCALE:

NTS

PLAN No.

SD18

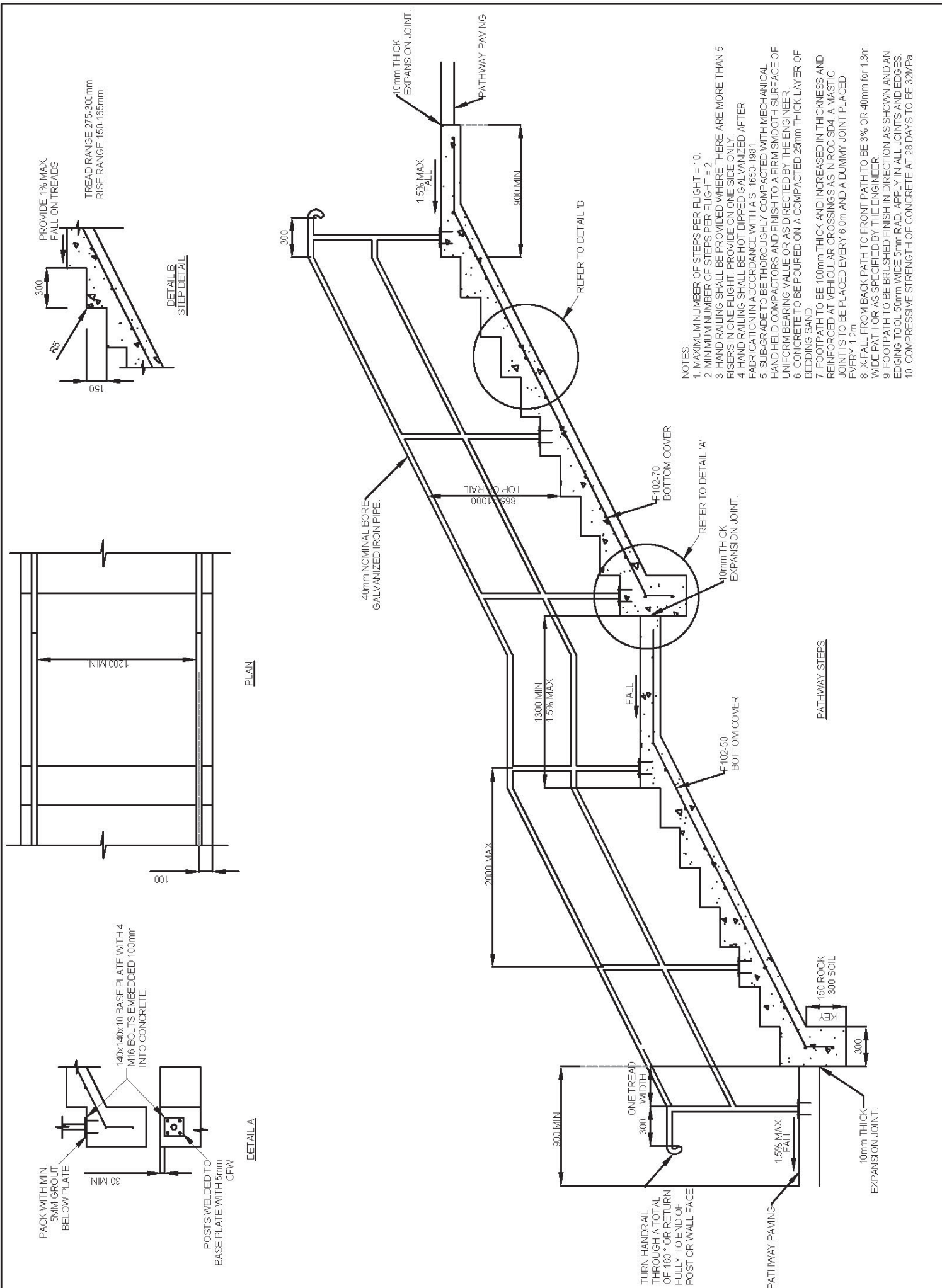


ISOMETRIC VIEW

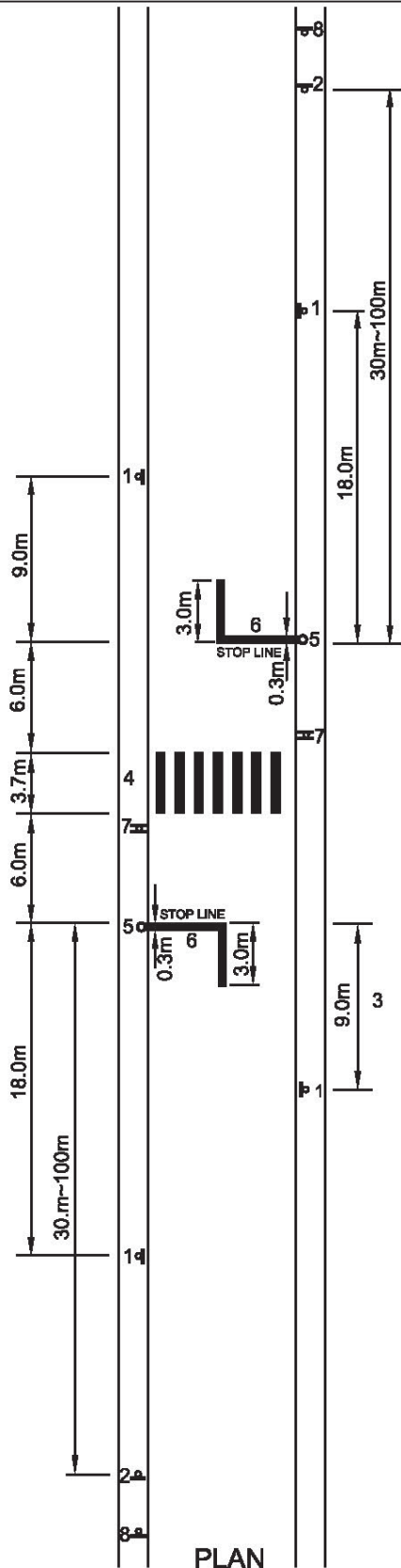
NOTES:

1. SILT FENCE TO BE CONSTRUCTED BY STRETCHING A FILTER FABRIC APPROVED BY THE SUPERINTENDENT BETWEEN POSTS AT 3.0m CENTRES. FABRIC TO BE BURIED A MINIMUM OF 150mm ALONG IT'S LOWER EDGE.
2. SILT FENCE IS TO BE INSTALLED AND APPROVED BY COUNCIL'S SUPERVISING ENGINEER BEFORE OVERBURDEN IS REMOVED. THIS FENCE MAY REQUIRE REPLACEMENT AT TIMES IF LOCATED WITHIN OR NEARBY CONSTRUCTION ZONES.
3. CLEAN BEHIND FENCE AFTER EACH MAJOR STORM OR OTHERWISE AS DIRECTED AND REMOVE ALL SILT FROM THE SITE. SITE DISPOSAL WILL ONLY BE APPROVED WHERE IT CAN BE ESTABLISHED THAT NO FURTHER EROSION OF THE MATERIAL CAN OCCUR.

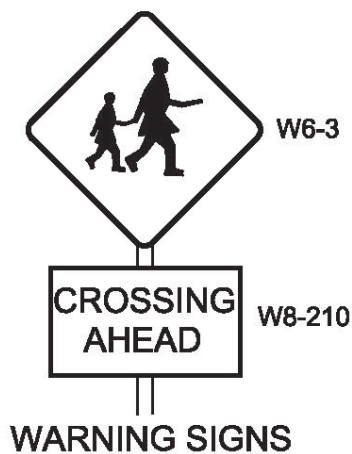
DRAWN BY NMcfall	CHECKED FRotta	CITY OF RANDWICK SILT FENCING DETAILS	SCALE: NTS
DESIGNED NMcfall	APPROVED ENGINEER MSavage		PLAN No. SD19
DATE 9/3/01			



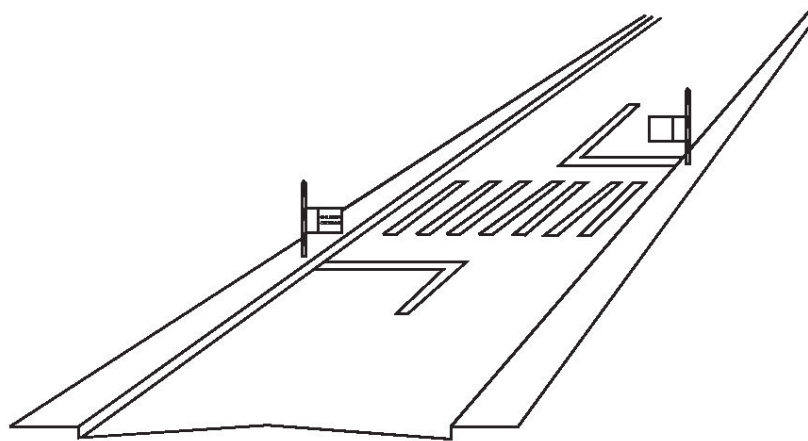
DRAWN BY K Assadi	CHECKED S Audet	CITY OF RANDWICK STANDARD PATHWAYS STEPS AND FOOTPATH	SCALE: N.T.S
DESIGNED BY J Wannenburg	APPROVED J Ingegneri		PLAN NO. SD20
DATE 11/02/14			



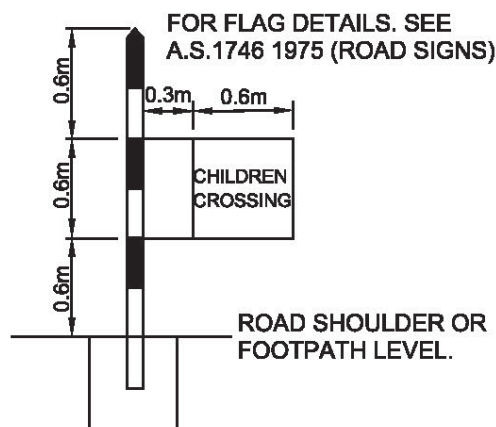
PLAN



WARNING SIGNS



PERSPECTIVE VIEW

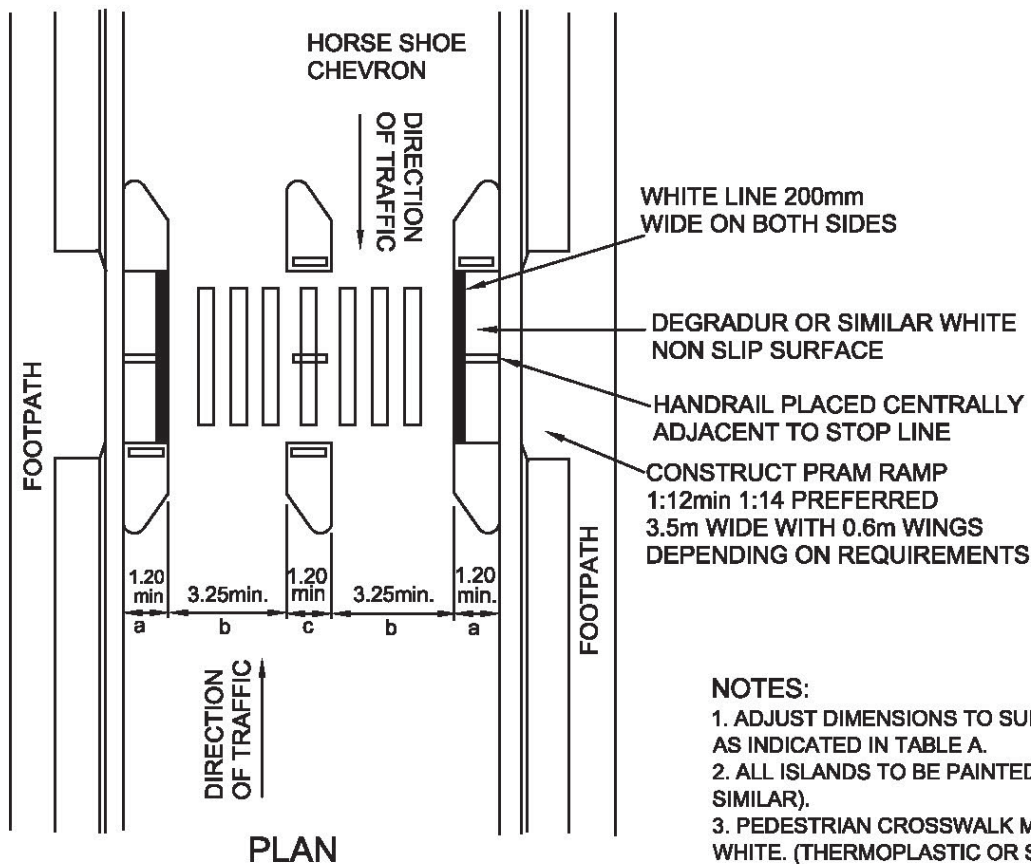


MARKER POST WITH FLAG

KEY:

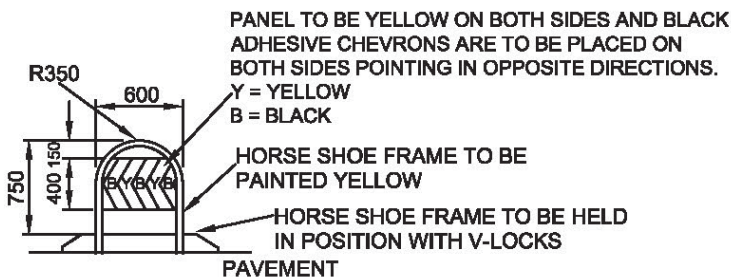
1. NO STOPPING SIGNS. SPECIFIC HOURS MAY BE SPECIFIED.
2. CHILDREN SIGN (W6-3) WITH CROSSING AHEAD SIGN.
3. DISTANCE MAY BE REDUCED TO 6.0m ON DEPARTURE SIDE ON ONE-WAY STREETS.
4. ZEBRA MARKINGS.
5. POSTS WITH FLAGS. ALL POSTS PAINTED WITH ALTERNATE RED & WHITE BANDS 300mm WIDE.
6. PAINTED STOP LINE. PREFERABLY 6m FROM ZEBRA MARKINGS BUT MINIMUM REQUIRED IS 1m.
7. PEDESTRIAN CROSSING SIGN (R3-1)
8. PEDESTRIAN CROSSING AHEAD SIGN (W6-2), 30m-50m IN ADVANCE OF CROSSING IF REQUIRED.

DRAWN BY NMcFall	CHECKED FRotta	CITY OF RANDWICK STANDARD CHILDREN'S CROSSING	SCALE: NTS
DESIGNED NMcFall	APPROVED ENGINEER MSavage		PLAN No. SD22
DATE 9/3/01			

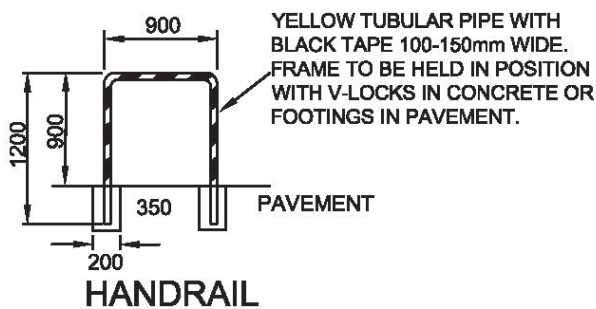


NOTES:

1. ADJUST DIMENSIONS TO SUIT WIDTH BETWEEN KERBS AS INDICATED IN TABLE A.
2. ALL ISLANDS TO BE PAINTED WHITE (THERMOPLASTIC OR SIMILAR).
3. PEDESTRIAN CROSSWALK MARKINGS TO BE PAINTED WHITE. (THERMOPLASTIC OR SIMILAR).
4. ALL APPROACH ISLANDS TO HAVE HORSE SHOE CHEVRONS AS INDICATED ON PLAN.
5. CONSTRUCT 4.5m WIDE PRAM RAMP TO SUIT. PREFERRED SLOPE 1:14 & MIN. 1:12
6. ROADS WIDER THAN 13m REQUIRE SPECIAL TREATMENT TO SUIT SITE CONDITIONS.
7. ROADS NARROWER THAN 11m BETWEEN KERBS ARE UNSUITABLE FOR MAGPIE CROSSINGS.



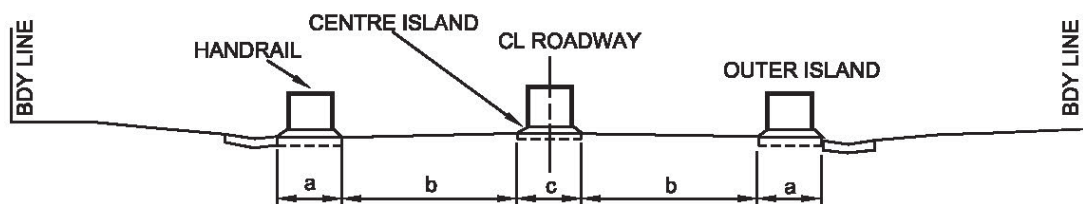
HORSE SHOE CHEVRON DETAIL



HANDRAIL

TABLE 'A'
DIMENSIONS - VARIOUS ROADS

WIDTH BETWEEN FACE OF KERB	a (m)	b (m)	c (m)
11.0m	1.20	3.25	1.20
11.5m	1.45	3.25	1.20
12.0m	1.60	3.30	1.30
12.25m	1.75	3.30	1.50
13.0m	1.85	3.35	1.70



SECTION A-A

DRAWN BY NMcFall

CHECKED FRotta

DESIGNED NMcFall

APPROVED

DATE 9/3/01

ENGINEER MSavage

CITY OF RANDWICK
STANDARD MAGPIE CROSSING

SCALE:

NTS

PLAN No.

SD23



DETAIL 'A'
IN MILLIMETRES

DETAIL 'A'
IN MILLIMETRES



SECTION 2-2

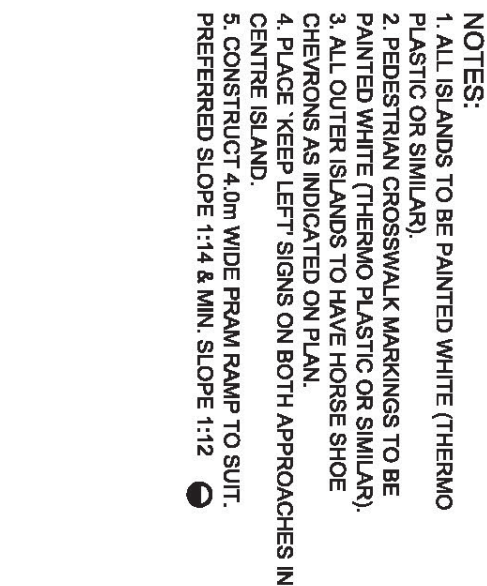
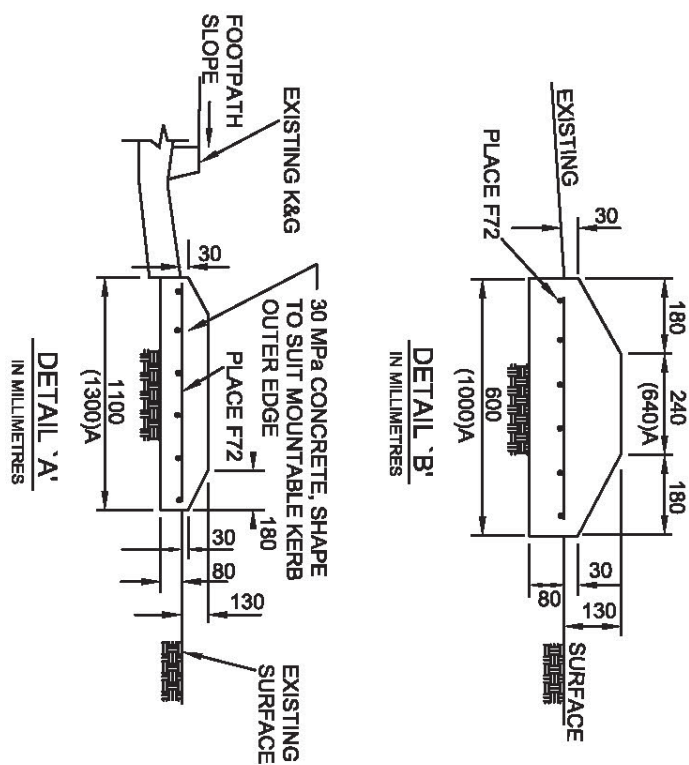
IN MILLIMETRES



1. ALL ISLANDS TO BE PAINTED WHITE (THERMO PLASTIC OR SIMILAR)

1. ALL ISLANDS TO BE PAINTED WHITE (THERMO PLASTIC OR SIMILAR)

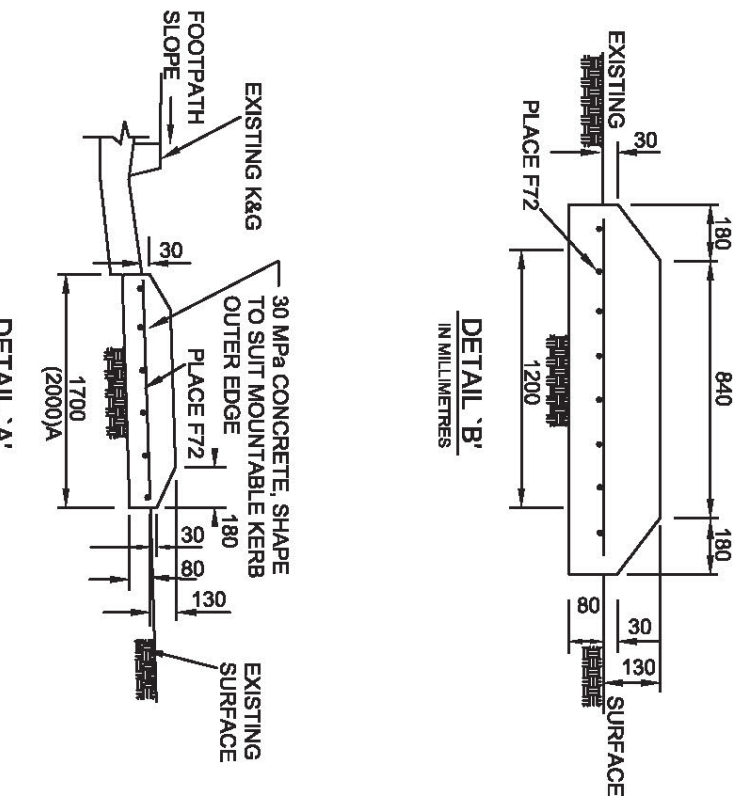
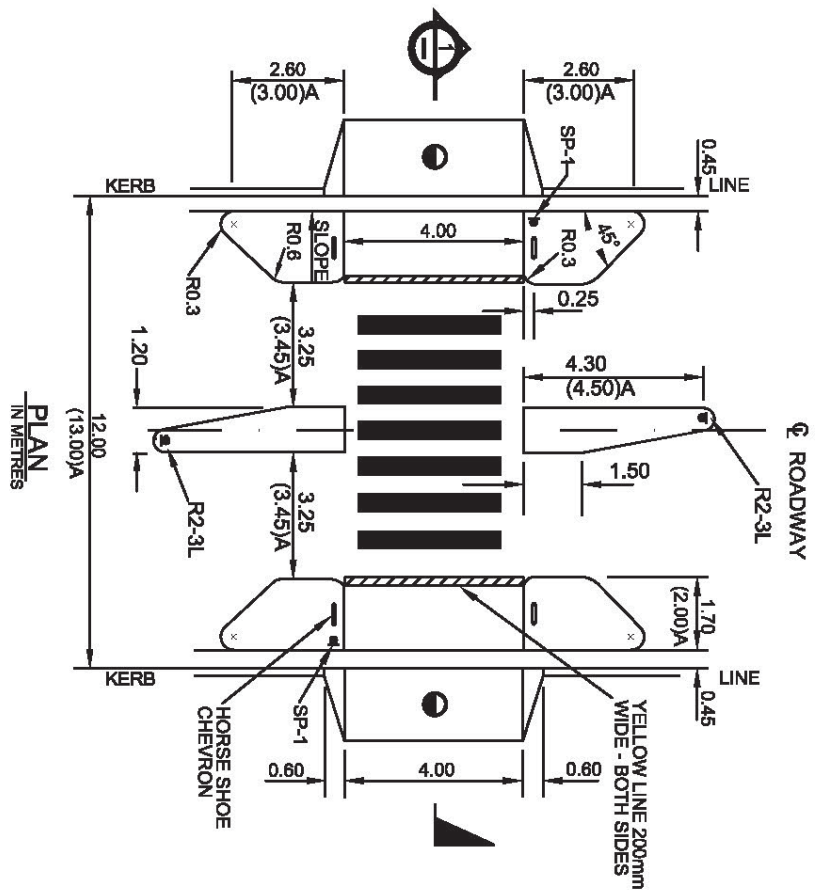
DRAWN BY NMcfFall	CHECKED J Ingegneri	CITY OF RANDWICK	SCALE: NTS
DESIGNED NMcfFall			PLAN No.
DATE 28/01/10	APPROVED ENGINEER M Shaw	WOMBAT CROSSING 10m TO 11m WIDE CARRIAGEWAY raised threshold-without centre island	SD25



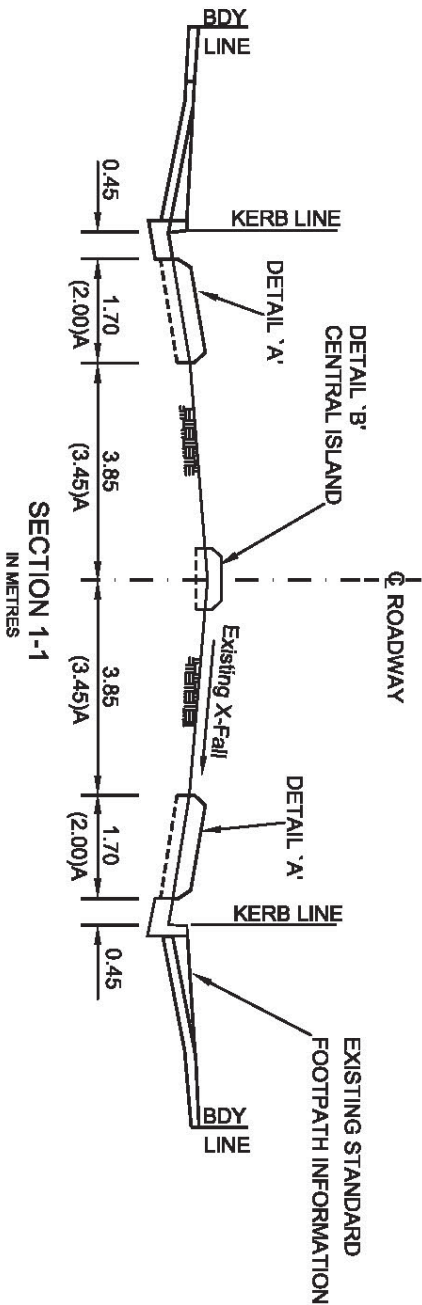
NOTES:

1. ALL ISLANDS TO BE PAINTED WHITE (THERMO PLASTIC OR SIMILAR).
2. PEDESTRIAN CROSSWALK MARKINGS TO BE PAINTED WHITE (THERMO PLASTIC OR SIMILAR).
3. ALL OUTER ISLANDS TO HAVE HORSE SHOE CHEVRONS AS INDICATED ON PLAN.
4. PLACE "KEEP LEFT" SIGNS ON BOTH APPROACHES IN CENTRE ISLAND.
5. CONSTRUCT 4.0m WIDE PRAM RAMP TO SUIT. PREFERRED SLOPE 1:14 & MIN. SLOPE 1:12

73



(..)A DENOTES DIMENSIONS FOR
A 13m WIDE ROADWAY.



- NOTES:**
1. ALL ISLANDS TO BE PAINTED WHITE (THERMO PLASTIC OR SIMILAR).
 2. PEDESTRIAN CROSSWALK MARKINGS TO BE PAINTED WHITE (THERMO PLASTIC OR SIMILAR).
 3. ALL OUTER ISLANDS TO HAVE HORSE SHOE CHEVRONS AS INDICATED ON PLAN.
 4. PLACE 'KEEP LEFT' SIGNS ON BOTH APPROACHES IN CENTRE ISLAND.
 5. CONSTRUCT 4.0m WIDE PRAM RAMP TO SUIT. PREFERRED SLOPE 1:14 & MIN. SLOPE 1:12

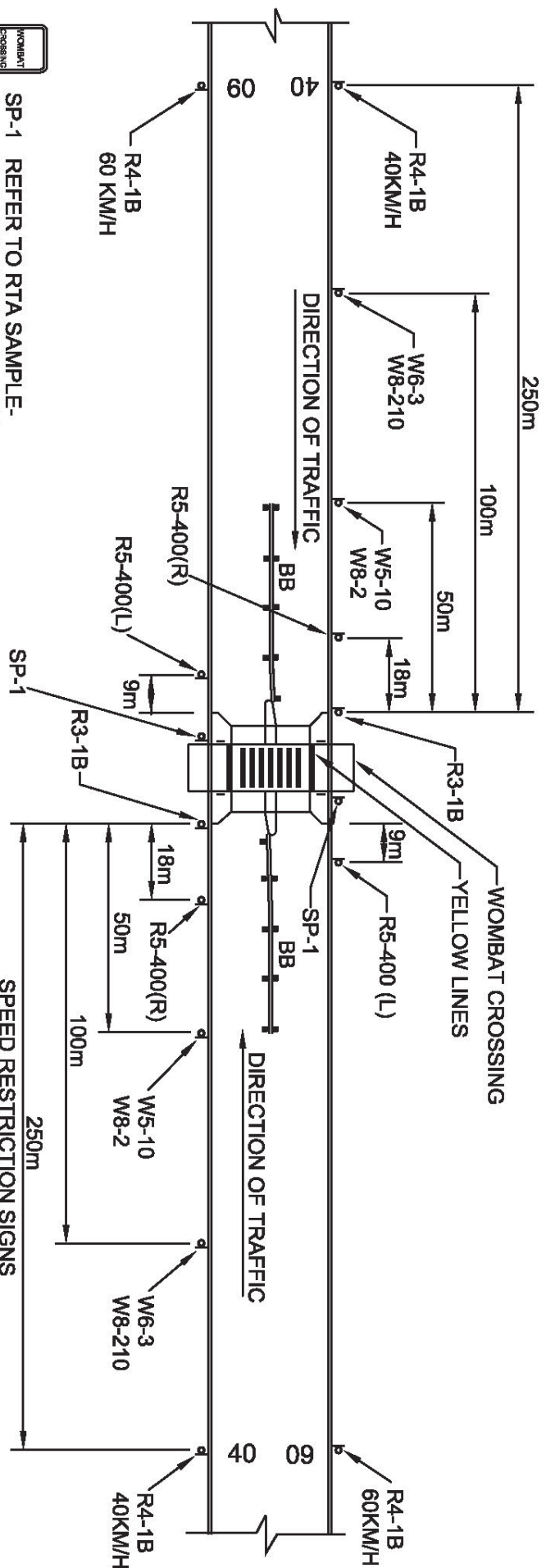
DRAWN BY NMcfFall
DESIGNED NMcfFall
DATE 9/3/01

CHECKED FRotta
APPROVED
ENGINEER MSavage

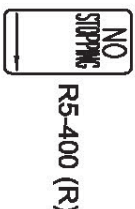
CITY OF RANDWICK

WOMBAT CROSSING 12m TO 13m WIDE
CARRIAGEWAY
flush threshold-with centre island

SCALE:
NTS
PLAN No.
SD27



SP-1 REFER TO RTA SAMPLE-
FRIENDLY WOMBAT SIGN.



NOTES:

1. PROVIDE PAIR TYPE Y-Y R.P.M. ON BB LINES AT 10m SPACINGS.
2. ALL ISLANDS TO BE PAINTED WHITE IN THERMO PLASTIC OR SIMILAR.
3. BB LINES AND 40KM/H 60KM/H ZONE PAVEMENT MARKINGS TO BE PAINTED WHITE IN THERMO PLASTIC OR SIMILAR.
4. WHERE NO CENTRAL MEDIAN ISLAND IS REQUIRED, BB LINES TO BE ADJUSTED TO SUIT.
5. HORSESHOE CHEVRONS TO BE PLACED ON ALL FOUR OUTER ISLANDS.
6. ALL SIGN POSTS ON CONCRETE TO BE HELD IN POSITION WITH V-LOCKS.

CITY OF RANDWICK

WOMBAT CROSSING ALL ROADS
raised threshold-signposting & linemarking

SCALE:
NTS

PLAN No.
SD28

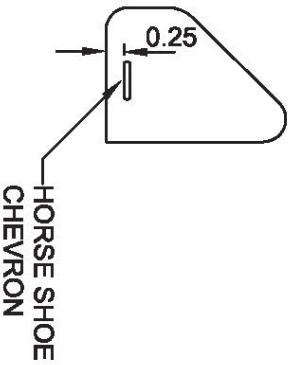
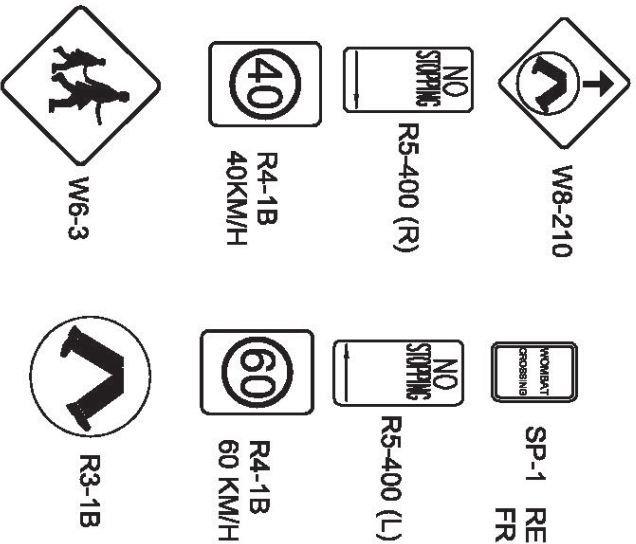
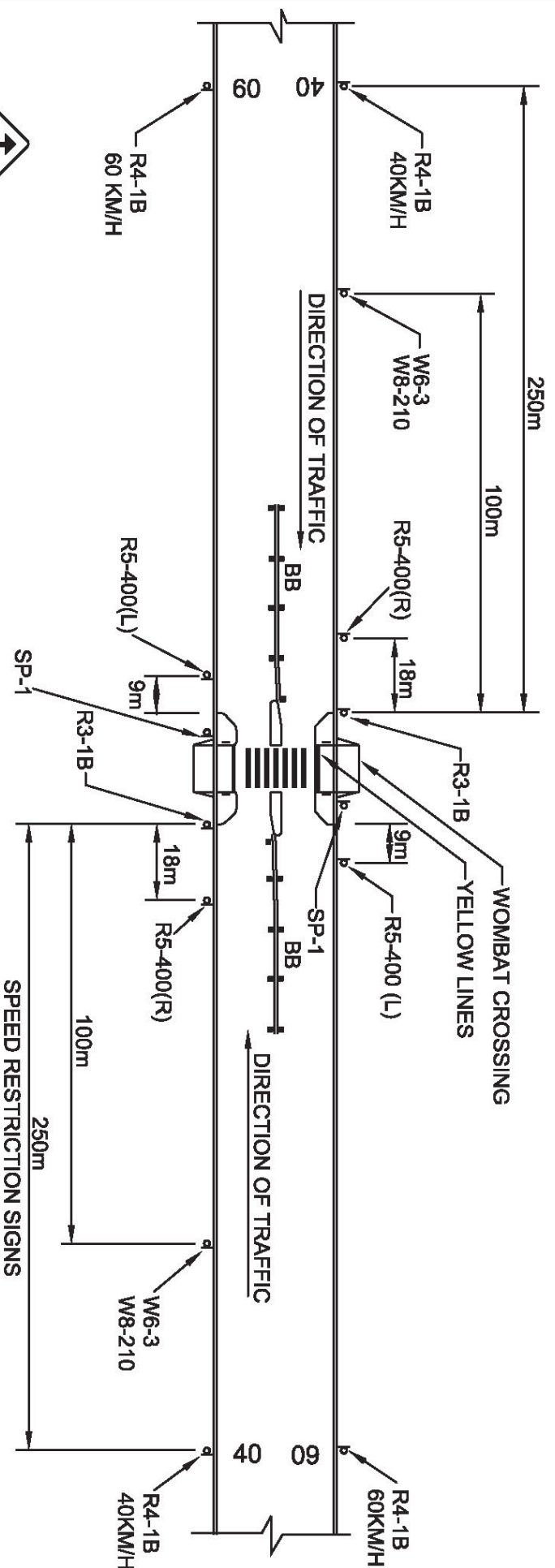
DRAWN BY **NMcFall**

DESIGNED **NMcFall**

DATE **28/01/10**

CHECKED **J Ingegneri**

APPROVED
ENGINEER **M Shaw**



NOTES:

1. PROVIDE PAIR TYPE Y-Y R.P.M. ON BB LINES AT 10m SPACINGS.
2. ALL ISLANDS TO BE PAINTED WHITE IN THERMO PLASTIC OR SIMILAR.
3. BB LINES AND 40KM/H 60KM/H ZONE PAVEMENT MARKINGS TO BE PAINTED WHITE IN THERMO PLASTIC OR SIMILAR.
4. WHERE NO CENTRAL MEDIAN ISLAND IS REQUIRED, BB LINES TO BE ADJUSTED TO SUIT.
5. HORSESHOE CHEVRONS TO BE PLACED ON ALL FOUR OUTER ISLANDS AS INDICATED ON THIS DRAWING.
6. ALL SIGN POSTS ON CONCRETE TO BE HELD IN POSITION WITH V-LOCKS.

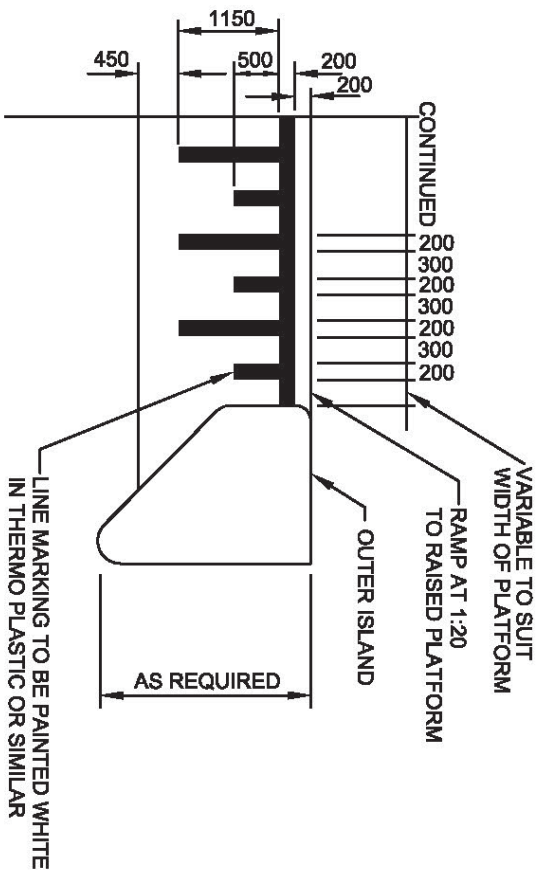
DRAWN BY **NMcFall**
DESIGNED **NMcFall**
DATE **28/01/10**

CHECKED **J Ingegneri**
APPROVED **M Shaw**
ENGINEER

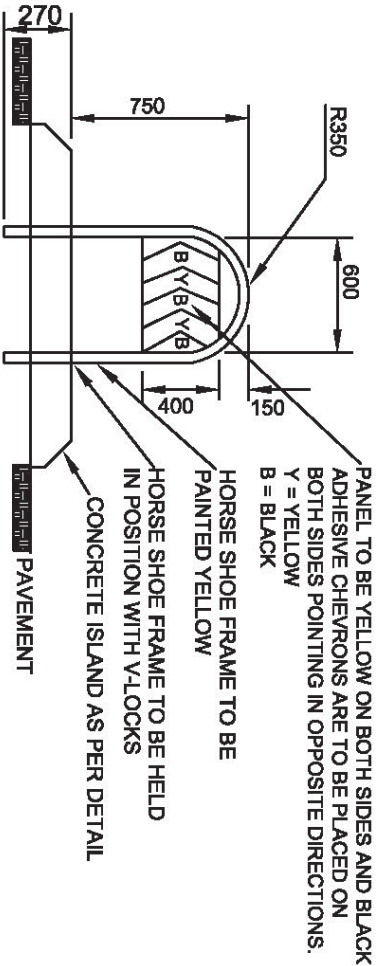
CITY OF RANDWICK

WOMBAT CROSSING ALL ROADS
flush threshold-signposting & linemarking

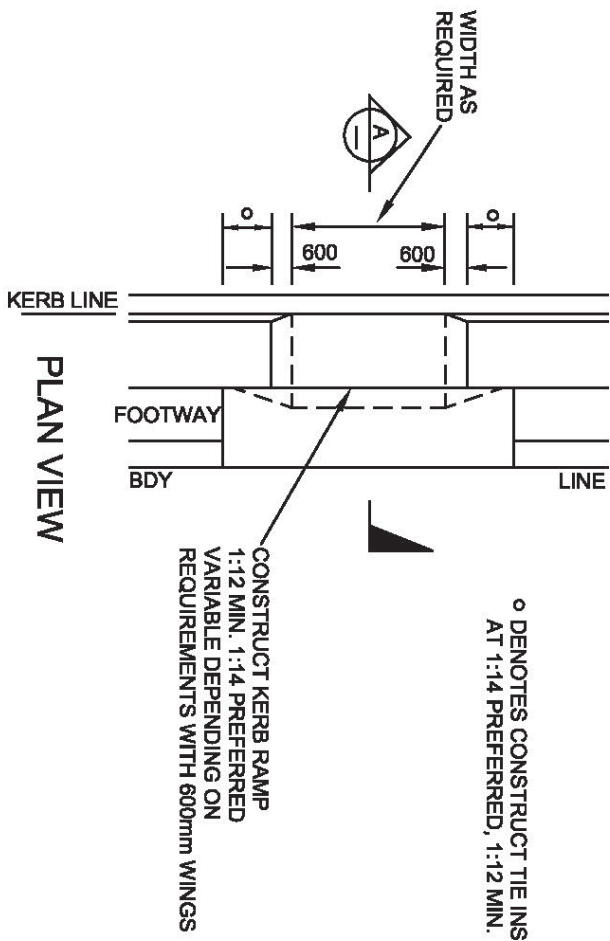
SCALE:
NTS
PLAN No.
SD29



PIANO KEY MARKING DETAILS



HORSE-SHOE CHEVRON DETAIL



TYPICAL KERB RAMP DETAIL

- NOTES:**
1. HIGH AND LOW LYING EXISTING FOOTPATH FORMATIONS REQUIRE SPECIAL TREATMENT AND DESIGN CONSIDERATION. MAINTAIN THE BASIC MINIMUM REQUIREMENT OF RAMP SLOPE 1:12.
 2. EVERY CROSSING SHOULD HAVE AT LEAST 10m TO 15m OF FORMALISED FOOTPATH FORMATION ON EITHER SIDE OF CROSSING.

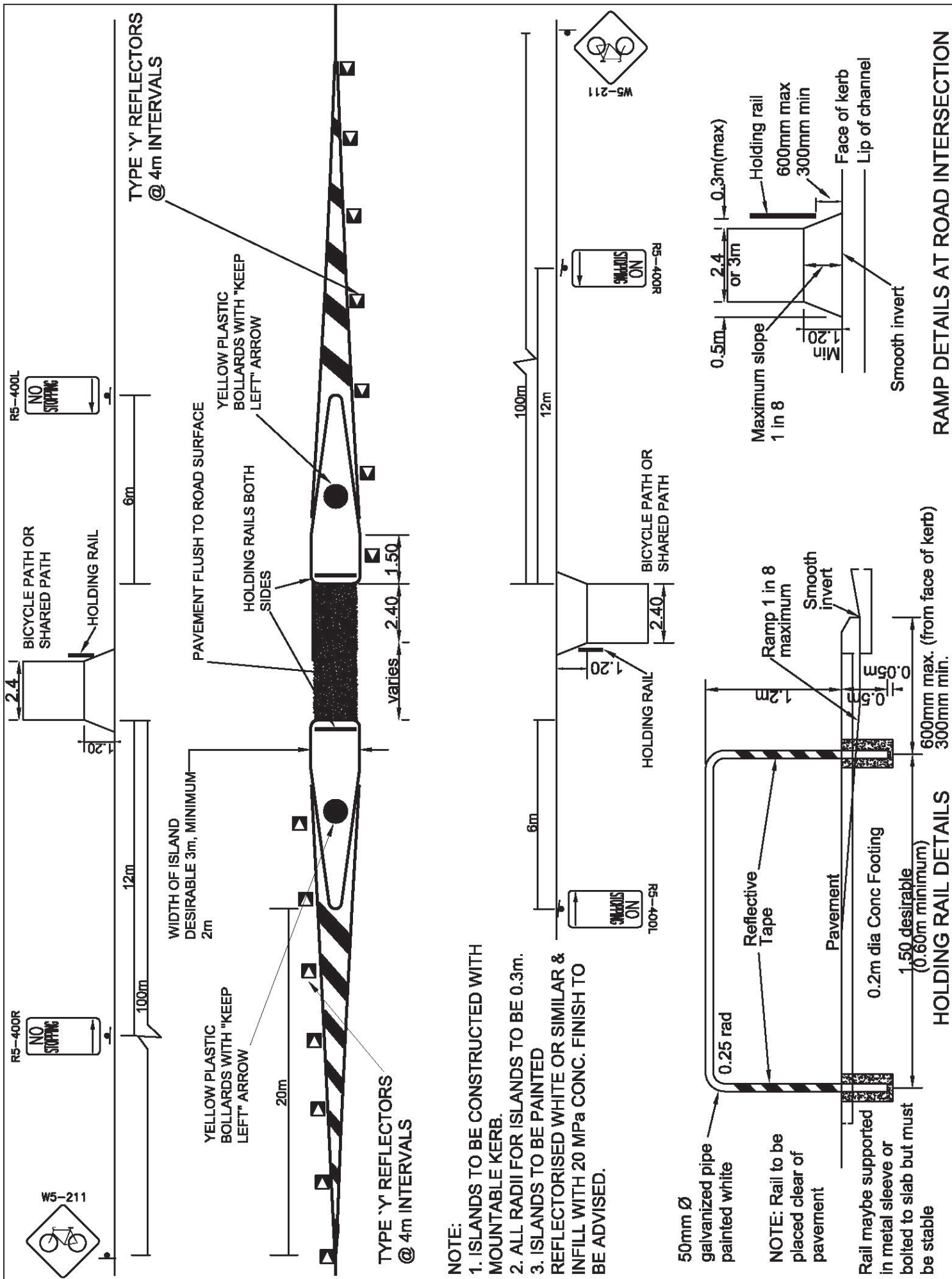
DRAWN BY NMcFall	CHECKED J Ingegneri	CITY OF RANDWICK WOMBAT CROSSING ALL ROADS SPECIAL DETAILS	SCALE: NTS
DESIGNED NMcFall	APPROVED ENGINEER M Shaw		PLAN No. SD30
DATE 28/01/10			



HOLDING RAIL DETAILS

SCALE:
NTS

PLAN No.
SD33



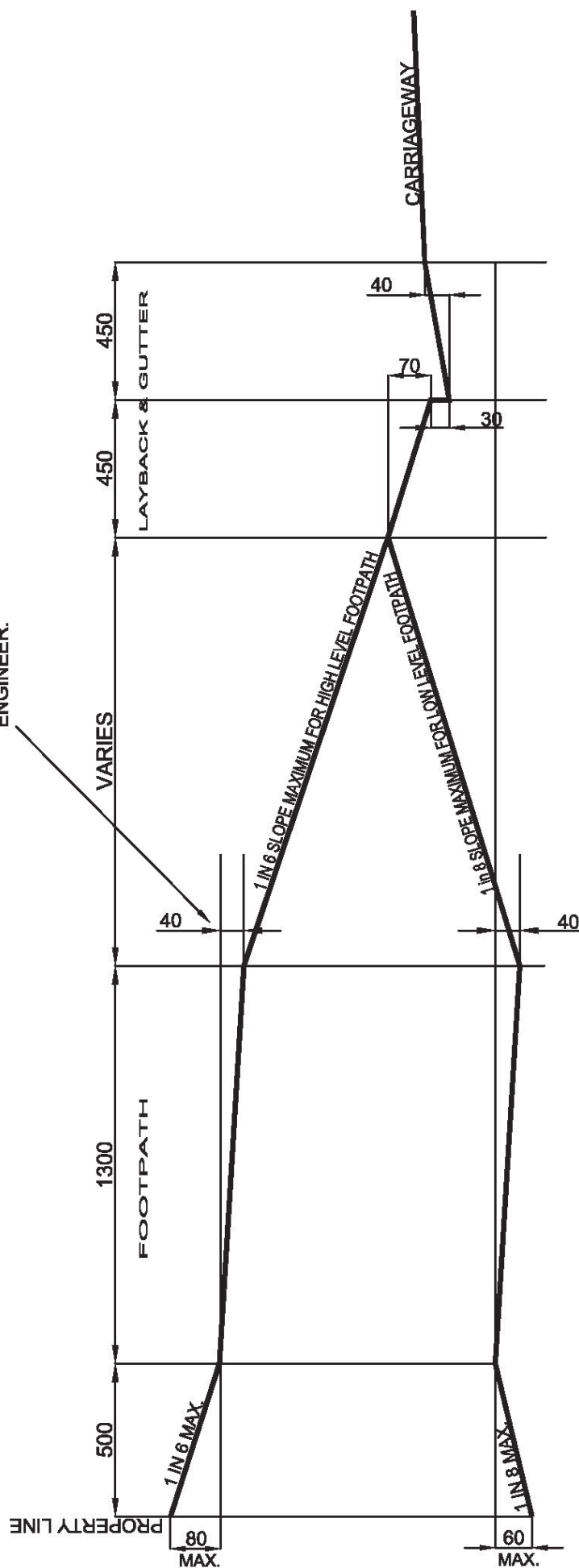
DRAWN BY N McFall
DESIGNED N McFall
DATE 15/3/2005

CHECKED F Rotta
APPROVED
ENGINEER J Frangoules

CITY OF RANDWICK CYCLIST REFUGE (TYPE B)

SCALE:
NTS
PLAN No.
SD34

FOR EXTREMELY HIGH PROPERTIES, THIS VALUE CAN BE INCREASED TO 80mm MAX. WITH THE APPROVAL OF THE ENGINEER.



DIMENSION IN MM
NOT TO SCALE

NOTES:
THIS STANDARD TO BE READ IN CONJUNCTION WITH RCC SD4 & SD20.

DRAWN BY	N McFall
DESIGNED	N McFall
DATE	28/01/10

CHECKED	J Ingegneri
APPROVED ENGINEER	M Shaw

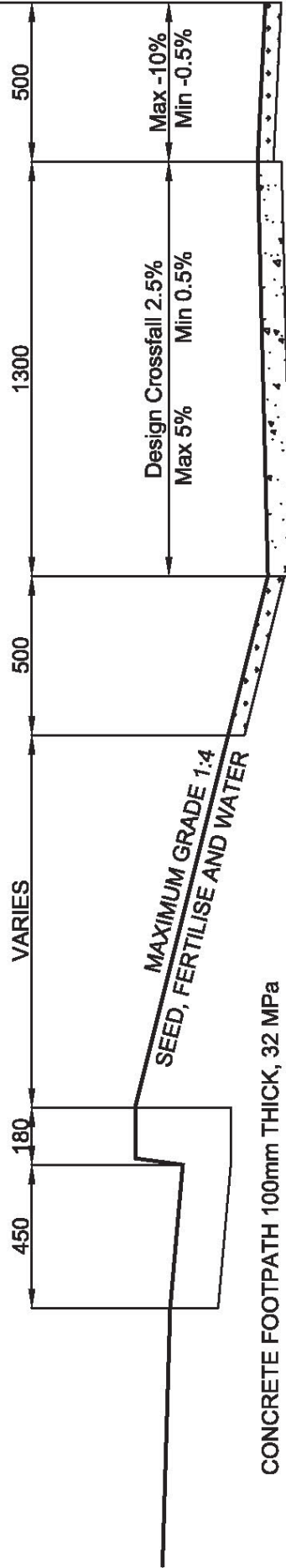
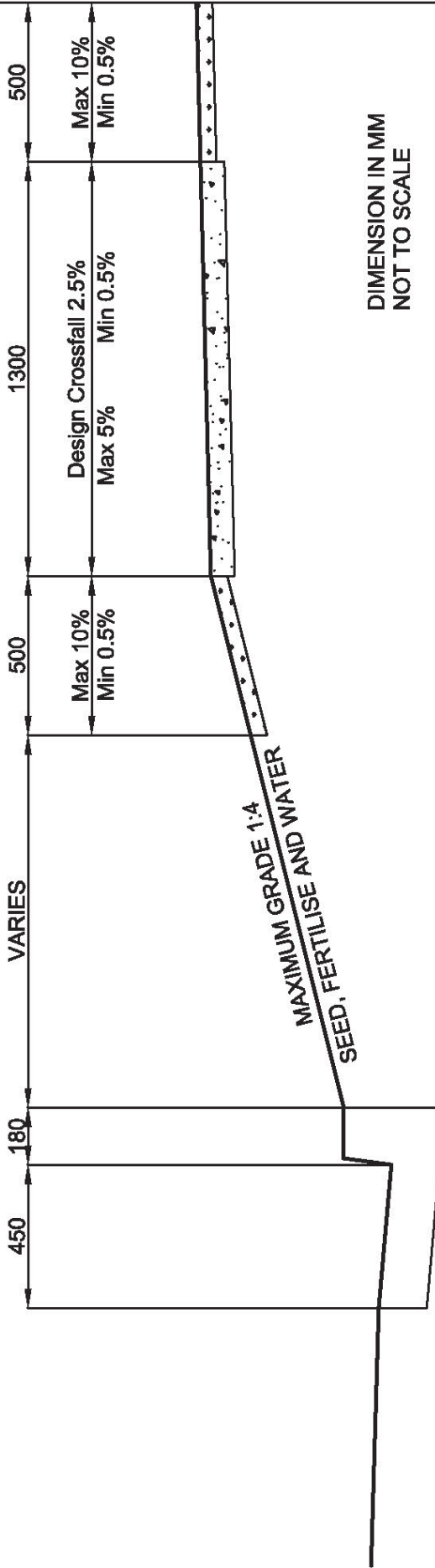
CITY OF RANDWICK

DRIVEWAYS & FOOTPATHS

STANDARD X-SECTIONS

SCALE:	NTS
PLAN No.	SD35

PROPERTY LINE



NOTES:

CONTRACTOR SHALL ENSURE THAT STORMWATER IS ABLE TO FREELY DRAIN TO THE KERB AND GUTTER WITHOUT ERODING THE GRASS VERGE. NO PONDING SHALL OCCUR ANYWHERE ON THE FOOTPATH. THIS STANDARD TO BE READ IN CONJUNCTION WITH RCC SD4.

CONCRETE FOOTPATH 100mm THICK, 32 MPa STRENGTH. MASTIC JOINTS 10mm WIDE TO BE PLACED AT 6 METRE INTERVALS. DUMMY JOINTS TO BE PLACED AT 2 METRE INTERVALS. EXCAVATE AND COMPACT EXISTING SUBGRADE. PROOF ROLL TO SATISFACTION OF SUPERINTENDANT.



EXCAVATE AND LAY KYKUYU TURF. WATER DAILY FOR 7 DAYS.



DRAWN BY **V Le**
DESIGNED **J Earls**
DATE **28/01/10**

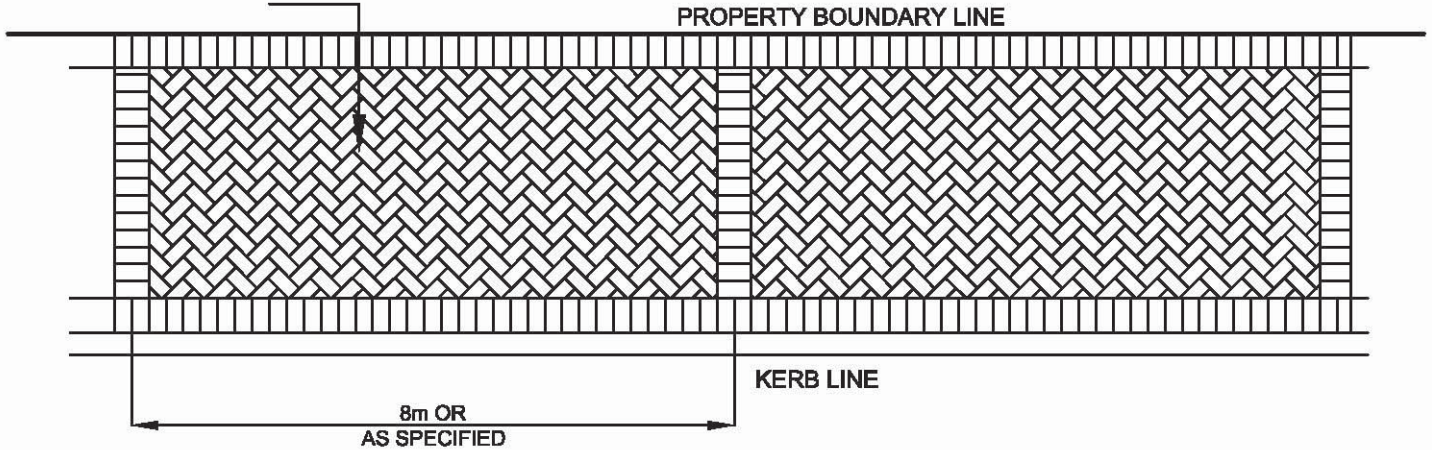
CHECKED **J Ingegneri**
APPROVED ENGINEER **M Shaw**

CITY OF RANDWICK
STANDARD FOOTPATH AND
NATURE STRIP X-SECTIONS

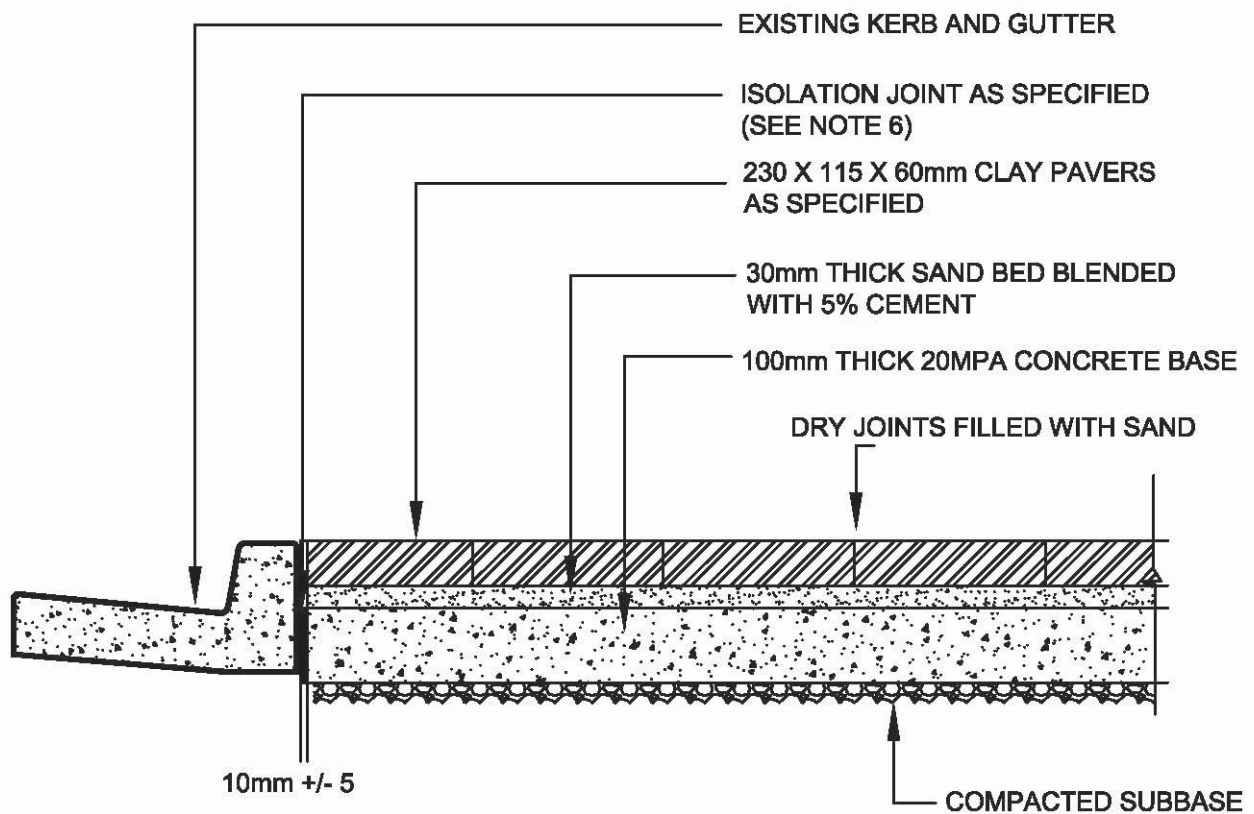
SCALE:
NTS
PLAN No.
SD36

STANDARD 230 x 115 x 60mm CLAY PAVERS
TO BE LAID IN HERRINGBONE PATTERN OR SIMILAR

PROPERTY BOUNDARY LINE



PLAN

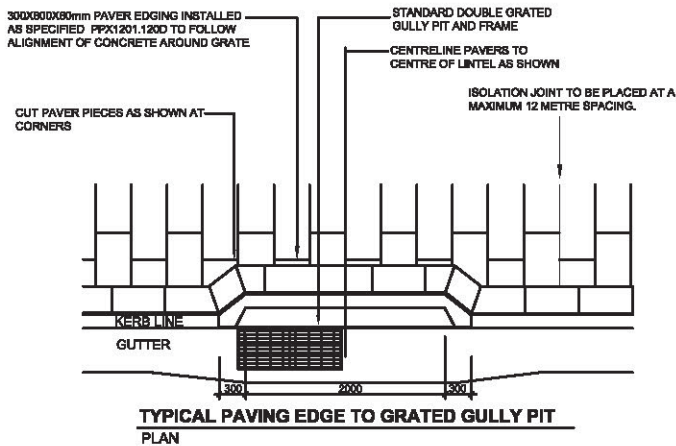


CROSS-SECTION

NOTES:

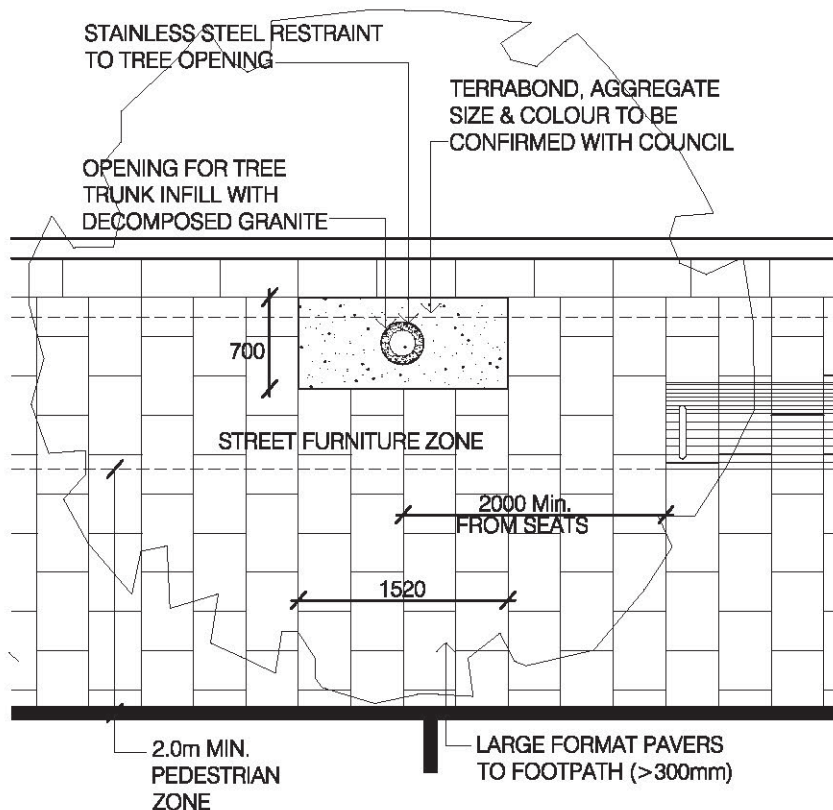
1. THE PAVEMENT UNITS SHOULD BE LAID WITH A HEADER COURSE AND HERRINGBONE PATTERN AS SHOWN IN THE ABOVE PLAN VIEW.
2. ALL DIMENSIONS TO BE TAKEN FROM THE REAR OF THE KERB. COUNCIL SUPERINTENDANT TO CONFIRM SETOUT ON SITE.
3. THE PAVEMENT UNITS SHOULD BE LAID ON 30mm THICK SAND BED BLENDED WITH 5% CEMENT ON TOP OF 100mm THICK CONCRETE BASE.
4. THE CONCRETE BASE IS TO BE OF 20MPa COMPRESSIVE STRENGTH AT 28 DAYS.
5. THE SUBBASE SHOULD BE COMPACTED.
6. ISOLATION JOINT TO BE 10mm WIDE MASTIC JOINT.

DRAWN BY	STran	CHECKED	J Ingegneri	CITY OF RANDWICK	SCALE:
DESIGNED	STran	APPROVED	M Shaw		NTS
DATE	01/02/10	ENGINEER		STANDARD CLAY PAVER DETAIL	PLAN No. SD38



TYPICAL PLACEMENT

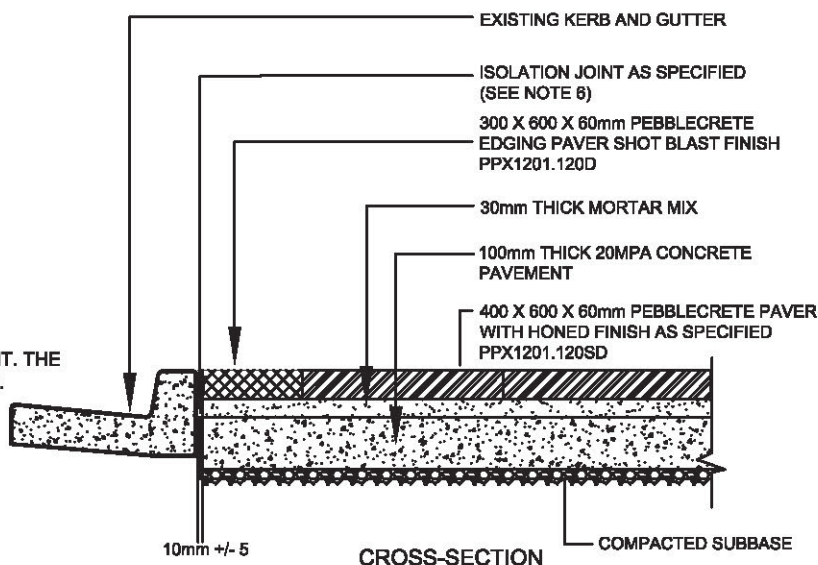
- * Tree surround to be adjacent and at right angles to kerb.
- * Tree placement is to not block pedestrian flow.
- * Avoid corners and maintain view lines for pedestrians and vehicles.
- * Place in line with shop boundaries to maintain views to shop windows and awning signage.



TYPICAL PAVEMENT LAYOUT PLAN

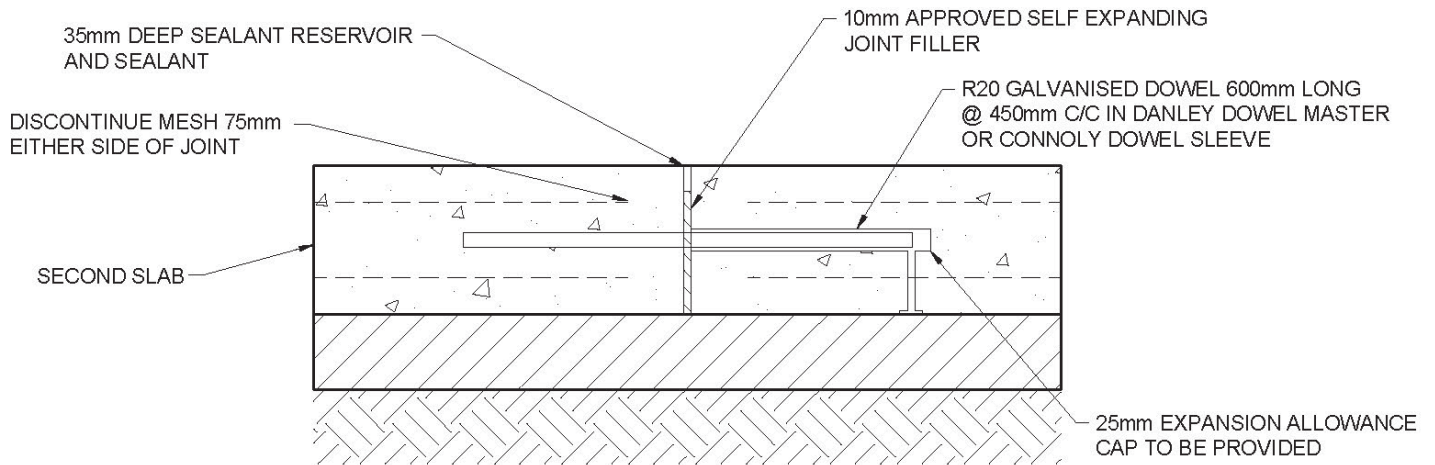
NOTES:

1. THE PAVEMENT UNITS SHOULD BE LAID AS SHOWN IN THE ABOVE PLAN VIEW.
2. ALL DIMENSIONS TO BE TAKEN FROM THE REAR OF THE KERB. COUNCIL SUPERINTENDANT TO CONFIRM SETOUT ON SITE.
3. THE PAVEMENT UNITS SHOULD BE LAID ON 30mm THICK MORTAR BED ON TOP OF 100mm THICK CONCRETE BASE.
4. THE CONCRETE BASE IS TO BE OF 20MPa COMPRESSIVE STRENGTH AT 28 DAYS.
5. THE SUBBASE SHOULD BE COMPACTED.
6. ISOLATION JOINT TO BE 10mm WIDE MASTIC JOINT. THE JOINT IS TO BE PLACED AT 12m MAXIMUM SPACING.

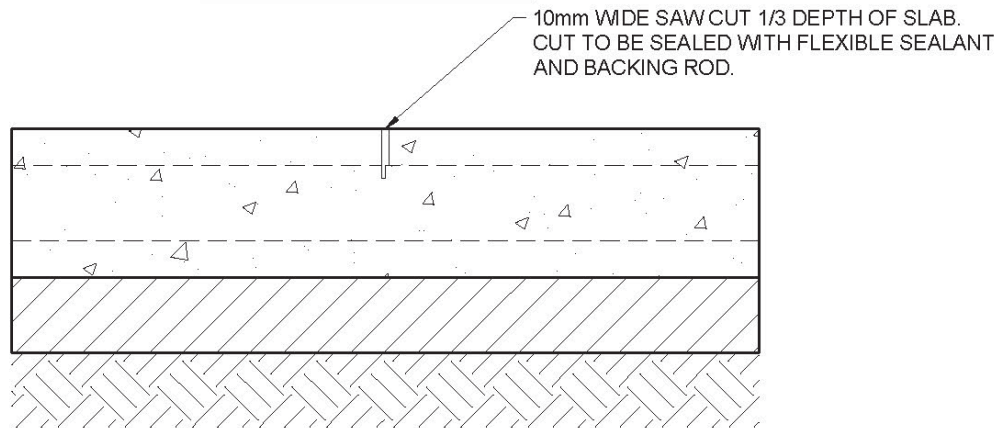


DRAWN BY	STran	CHECKED	J Ingegneri	CITY OF RANDWICK	SCALE:	
DESIGNED	STran	APPROVED ENGINEER	M Shaw		STANDARD CONCRETE PAVER FOOTPATH DETAIL	NTS
DATE	01/02/10					PLAN No.
					SD39	

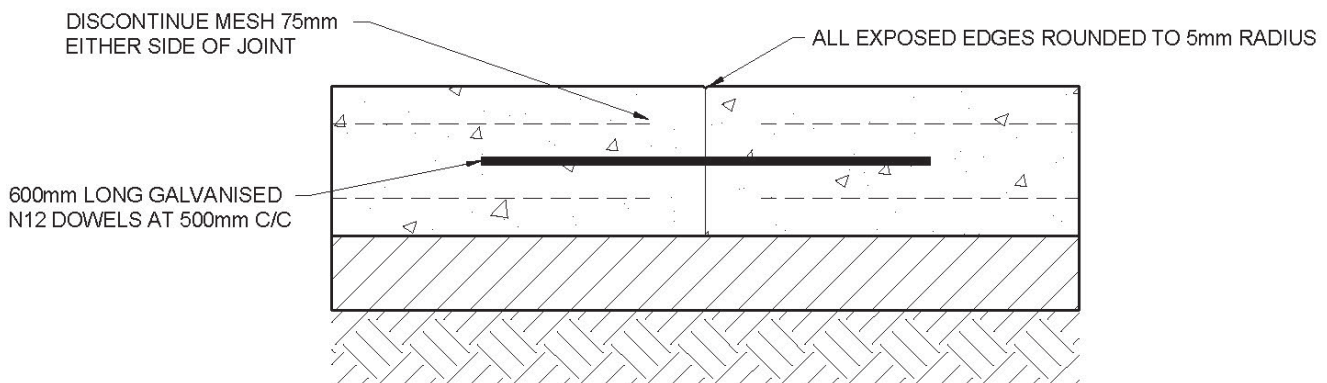
EXPANSION JOINT (EJ)



CONTRACTION JOINT (CJ)



DOWELLED CONSTRUCTION JOINT (DCJ)



NOTES:

1. TRANSVERSE EXPANSION JOINTS SHALL BE PLACED AT 20m MAXIMUM SPACING ON CONTINUOUS PAVEMENT.
2. TRANSVERSE CONTRACTION JOINTS TO BE PLACED AT 5m MAXIMUM SPACING ON CONTINUOUS PAVEMENT.
3. CONSTRUCTION JOINTS SHALL BE PLACED AT WORK EXTENTS WHEN JOINING ONTO RIGID PAVEMENTS.
4. NOT APPLICABLE TO REGIONAL OR FEEDER ROADS.
5. SITE SPECIFIC DESIGN REQUIRED FOR CBR<7.

DRAWN BY J Wanneburg

CHECKED S Audet

DESIGNED

APPROVED
ENGINEER J Ingegneri

DATE 17/02/14

CITY OF RANDWICK

TRAFFICABLE JOINTS - EXPANSION,
CONTRACTION AND CONSTRUCTION

SCALE:

1:10

PLAN No.

SD42

Technical Specification for Minor Works

6

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177 TECHNICAL SPECIFICATION FOR SERVICE
--

1 PROJECT SPECIFIC INFORMATION

1.1 LOCATION AND DESCRIPTION OF PROJECT

- *Projects will be based at various locations within the City of Randwick*
- *The description of the work will be based on individual projects which incorporate item/s from the priced schedule of rates.*
- *The period of contract for individual projects will be dependant on the scope of individual projects.*
- *The specific site requirements will be dependant on individual projects and will be monitored by the Superintendent.*

1.2 EXTENT OF WORK

Work under this Contract comprise the supply of labour, materials and equipment necessary to carry out the services specified.

The work includes but is not limited to *all items of work as described in the schedule of rates* which shall be carried out in their entirety in strict accordance with and to the true intent and purpose of the Conditions of Contract, these Technical Specifications, the Schedules and any Drawings provided with the contract documentation and under the supervision of the Superintendent:

1.3 WORK BY OTHERS

Liaison

Attention is drawn to the Conditions of Contract regarding the obligation of the Contractor to co-ordinate the Works with any simultaneous and/or adjacent work by others.

The Principal retains the right to exclude work which is not programmed under the Specification and assign such work or service to others.

The Contractor will co-ordinate activities with work by others by participating in necessary communication procedures to avoid disruption, delays, conflict and/or confusion with other activities authorised by the Principal (e.g. special events, additional internal surveillance, construction work, etc.).

Description

The description of activities will be dependant on individual projects and timing of the work. The Superintendent will be responsible for setting out the scope of the project.

1.4 PROGRAMMING OF SERVICES

The programming of the services will be dependant on individual projects.

1.5 RESERVED FOR OTHER PROJECT SPECIFIC ITEMS

Other project specific items will be dependant on individual projects.

2 GENERAL

2.1 DRAWINGS

Randwick City Council standard drawings are included in these documents.

2.2 STANDARDS AND TEST METHODS

Australian Standards

Unless otherwise specified in the Contract, and where applicable, materials, workmanship and test methods shall be in accordance with the relevant standard of Standards Australia.

Applicable edition

Documents referred to in this Specification shall be deemed as the latest edition of the Australian Standards, including amendments and supplements.

Overseas Standards

Overseas standards and other standard documents named in the Specification shall be applicable in the same manner as Australian Standards to relevant materials and workmanship.

Copies to be kept on site

Copies of any standards quoted or referred to in the Specification shall be kept on the site if so specified.

Test methods other than Australian Standards

Test Methods, other than Australian Standards, specified in the technical specifications shall refer to the issue dates current at 14 days prior to the closing date for tenders unless otherwise specified.

2.3 QUALITY ASSURANCE

The Contractor shall operate a Quality Plan in conjunction with the execution of the Works under this Contract.

The Contractor's Quality Plan shall include:

- Documented procedures for all services to be provided under the Contract.
- A Contractor's supervisory inspection and audit program.
- A procedure for diary records for all patrols as well as the off-site control room.
- A procedure for checklists to confirm functionality of all surveillance systems and locks.
- A procedure for the interviewing and vetting of all employees to confirm good character, valid license and suitable skill levels.

The Contractor shall provide free access to the Principal and Superintendent so as to facilitate convenient and efficient inspection of the Contractor's Quality Plan records at any stage of the Contract.

The Contractor shall allow copies of documentation to be taken for the Principal's records as requested.

2.4 WORKING AREAS**Designated sites**

Where the Specifications and/or Drawings indicate working areas and areas for the storing of materials, use of plant and erection of sheds, work shall not be performed nor the site occupied outside of these areas.

Security

The Principal will not be responsible for the safe-keeping of any of the Contractor's plant, equipment, tools, materials or other property.

Temporary fencing

If existing fencing on the Principal's property is cut or altered by the Contractor, the Contractor shall provide and maintain temporary fencing to the satisfaction of the Superintendent during the Contract to prevent unauthorised entry into the Principal's property, and shall reinstate the fencing and remove temporary fencing on completion of the work.

2.5 PAY ITEMS

No separate measurement and payment shall be made for compliance with the requirements of this specification.

2.6 RESERVED FOR OTHER GENERAL REQUIREMENTS

NIL

3 ENVIRONMENTAL REQUIREMENTS

3.1 PROTECTION OF THE ENVIRONMENT

Conformance to Acts

All work shall be carried out in such a manner as to avoid nuisance and/or damage to the environment.

The Contractor shall comply with the requirements of all statutory regulations and local Council requirements with regard to protection of the environment.

No variation in costs or adjustments in programme will be considered due to these requirements.

Noise or other nuisance

No noise or other nuisance, which in the opinion of the Superintendent is unnecessary or excessive shall be permitted in the performance of the Works.

Damage and compensation payments

The Contractor will be responsible for any damage and compensation payments as a result of non observance of legal, statutory and local Council regulations and requirements with regard to protection of the environment.

3.2 RESERVED FOR OTHER PROJECT SPECIFIC ENVIRONMENTAL REQUIREMENTS

All additional environmental requirements shall be project specific and approved by the Superintendent.

4 UTILITIES AND AUTHORITIES

4.1 GENERAL

The Contractor shall conduct operations so as not to interfere with the work or installations and assets of Public Utilities and Public Authorities.

The Contractor shall have no right to monetary compensation or to any claim for damages owing to the provision of such co-operation.

5 SITE FACILITIES

5.1 WORKERS' FACILITIES

The Contractor shall provide facilities for all employees and sub-contractors.

Principal's approval shall be necessary in writing prior to the utilisation of any space or facilities within the building, facilities or secured areas nominated under this Contract.

0201 DEMOLITION**1 GENERAL****1.1 CROSS REFERENCES****General**

Requirement: Conform to the following:

- *General requirements.*

1.2 STANDARD**General**

Demolition: To AS 2601.

1.3 INTERPRETATION**Definitions**

For the purposes of this worksection, the following definitions apply:

- Demolition: The complete or partial dismantling of a building, structure or any hard or soft surface removal, by pre-planned and controlled methods or procedures.
- Dilapidation record: The photographic or video and written record made before commencement of demolition work of the condition of the portion of the existing building being retained, adjacent buildings, and other relevant structures or facilities.
- Dismantle: The reduction of an item to its components in a manner to allow re-assembly.
- Recover: The disconnection and removal of an item in a manner to allow re-installation.

1.4 INSPECTION**Notice**

Inspection: Give notice so that inspection may be made of the following:

- Adjacent structures before commencement of demolition.
- Services before disconnection or diversion.
- Trees as documented to be retained, before commencement of demolition.
- Contents of building before commencement of demolition.
- Structure after stripping and removal of roof coverings and external cladding.
- Underground structures after demolition above them.
- Excavations remaining after removal of underground work.
- Site after removal of demolished materials.
- Services after reconnection or diversion.

1.5 SUBMISSIONS**Authorities**

Evidence of compliance: Before commencing demolition, submit evidence of the following:

- Requirements of authorities relating to the work under the contract have been ascertained.
- A permit to demolish has been obtained from the appropriate authority.
- A scaffold permit has been obtained from the appropriate authority (if scaffolding is proposed to be used).
- Precautions necessary for protection of persons and property have been taken and suitable protective and safety devices have been provided to the approval of the relevant authority.
- Treatment for rodent infestation has been carried out and a certificate has been obtained from the appropriate authority.
- Fees and other costs have been paid.

Investigation and work plan

Work plan: Submit the work plan before demolition or stripping work. Include the following information:

- The method of protection and support for adjacent property.
- Locations and details of necessary service deviations and terminations.
- If removal of asbestos or of material containing asbestos is required, the information specified in NOHSC 2002 Code of Practice for the Safe Removal of Asbestos. Include information to be supplied to the removalist in clause 7.2.4, and information to be supplied by the removalist in clause 7.3.
- Confirmation of the sequence of work in Demolition below.
- Requirements of AS 2601 Section 2 Planning and execution.

Records

Dilapidation record: Submit a copy of the dilapidation record for inspection. Submit to each owner of each adjacent property a copy of the part of the record relating to that property, and obtain their written agreement to the contents of the record, prior to commencement of demolition.

Stockpiles

Location: Submit the locations for on-site stockpiles to be used for demolished materials for recycling in the works. Coordinate with the locations of storage for other waste streams and prevent mixing or pollution.

Recycling

Delivery location: Submit the name and address of the proposed recycling facility.

Certification: Provide evidence of delivery to the nominated recycling facility.

2 PRODUCTS**2.1 DEMOLISHED MATERIALS****Demolished materials classes**

Ownership and implementation: Comply with the **Demolished materials classes table**.

Demolished materials classes table

Class	Requirement	Ownership
Recovered items for re-use in the works	Recover without damage items identified in the Recovered items for re-use in the works schedule	Principal/proprietor
Recovered items for delivery to the principal	Recover without damage items identified in the Recovered items for delivery to the principal schedule	Principal/proprietor
Demolished material for recycling in the works	Stockpile material identified in the Demolished material for recycling in the works schedule	Contractor
Demolished material for recycling off site	Demolish and deliver for recycling material identified in the Demolished material for recycling off-site schedule	Contractor
Dismantle for relocation as part of the works	Dismantle without damage and store items identified in the Dismantle for relocation schedule	Principal/proprietor
Demolished for removal	Remove from the site demolished materials identified in the Demolish for removal schedule. Do not burn or bury on site Transit: Prevent spillage of demolishing materials in transit	Contractor

3 EXECUTION**3.1 SUPPORT****Temporary support**

General: If temporary support is required, certification for its design and installation is required from a professional engineer engaged by the contractor.

Existing buildings: Until permanent support is provided, provide temporary support for sections of existing buildings which are to be altered and which normally rely for support on work to be demolished.

Ground support: Support excavations for demolition of underground structures.

Adjacent structures: Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the works.

- Lateral supports: Provide lateral support equal to that given by the structure to be demolished.
- Vertical supports: Provide vertical support equal to that given by the structure to be demolished.

Permanent supports

General: If permanent supports for adjacent structures are necessary and are not documented, give notice and obtain instructions.

3.2 PROTECTION

Encroachment

General: Prevent the encroachment of demolished materials onto adjoining property, including public places.

Weather protection

General: If walls or roofs are opened for alterations and additions or the surfaces of adjoining buildings are exposed, provide temporary covers to prevent water penetration. Provide covers to protect existing plant, equipment and materials intended for re-use.

Dust protection

General: Provide dust-proof screens, bulkheads and covers to protect existing finishes and the immediate environment from dust and debris.

Security

General: Provide security to any site where demolition work is or has occurred.

Temporary screens

Delete

Temporary access

General: Provide temporary access around the demolition site.

Exposed surfaces

General: Where necessary protect and weatherproof the surfaces of adjacent structures exposed by demolition.

Fixed items

- *Delete*

Recovered items

General: Recover all components associated with the listed items that are essential for their re-use. Minimise damage during removal.

3.3 DEMOLITION

Dilapidation record

Purpose: Use the dilapidation record to assess the damage and making good arising out of demolition work.

Availability: Keep the records of the investigations on site and available for inspection until practical completion of the contract.

Encroachment

General: If encroachments from adjacent structures are encountered and are not documented, give notice and obtain instructions.

Concrete slabs

General: Using a diamond saw, neatly cut back or trim to new alignment with a clean true face existing concrete slabs to be partially demolished or penetrated.

Recycling: If concrete crushing is proposed on site, submit details of plant and environmental controls.

Refrigeration systems

- *Delete*

Explosives

General: Do not use explosives.

3.4 HAZARDOUS MATERIALS

Hazardous materials

Audit: Prepare a hazardous substances management plan to AS 2601 clause 1.6 *Hazardous substances*. Include the following:

- Asbestos or material containing asbestos.
- Flammable or explosive liquids or gases.
- Toxic, infective or contaminated materials.
- Radiation or radioactive materials.
- Noxious or explosive chemicals.
- Tanks or other containers which have been used for storage of explosive, toxic, infective or contaminated substances.

Removal: To AS 2601 clause 1.6.2.

3.5 COMPLETION

Notice of completion

General: Give at least 7 working days' notice of completion of demolition so that adjacent structures may be inspected following completion of demolition.

Making good: Make good any damage arising out of demolition work. Obtain written acceptance from the owner of each adjoining property of completeness and standard of making good.

Temporary support

General: Clear away at completion of demolition.

0221B SITE MANAGEMENT

1 GENERAL

1.1 RESPONSIBILITIES

General

Designated areas for protection will be dependant on individual projects. These areas will be outlined by the Project Superintendent.

Incidental works

Generally: Undertake the following:

- Reinstatement: Reinstatement undeveloped ground surfaces to the condition existing at the commencement of the contract.
- Minor trimming: As required to complete the works as documented.

1.2 CROSS REFERENCES

General

Nil

1.3 INTERPRETATIONS

Definitions

General: For the purposes of this worksection the following definitions apply:

- Clearance authority: Any authority covering statutory requirements relating to the project and requiring clearances for work in that particular area.
- Clearances: A formal certificate, approval or condition issued by a statutory authority to allow work to be carried out in a particular area.
- Contamination of land: The presence of a substance in, on or under the land at a concentration above that which is normally found in that locality, such that there presents a risk of harm to human health or to the environment.
- Green and organic waste: Includes all food wastes, vegetative wastes from land clearing and pruning operations, biosolids produced from the treatment of liquid wastes, garden wastes and forestry waste (bark and saw dust) and paper and cardboard products.
- Environment: The physical factors of the surroundings of human beings including the land, waters, atmosphere, climate, sound, odours, tastes, the biological factors of animals and plants and the social factor of aesthetics.
- Environmental audits: A review of environment management practices, in particular the evaluation of a site for environmental liability.
- Environmental impact assessment: A method for predicting environmental impacts of a proposed development including minimising identified impacts.
- Environmental management plan (EMP): A plan describing the management of the environmental issues and considerations for the activity being undertaken. This applies to the design, construction and operation of the buildings and infrastructure.
- Pollution incident: An incident or set of circumstances during or as a consequence of which there is, or is likely to be a leak, spill or other escape of a substance as a result of which pollution has occurred, is occurring or is likely to occur.
- Weed: An invasive plant that degrades our natural areas, reduces the sustainability or affects the health of people and animals.

1.4 SUBMISSIONS

Submissions program

A program is required to be submitted for individual projects prior to commencement.

Environmental management plan (EMP)

Submit an Environmental management plan and include the following details:

- Assignment of responsibility for environmental controls.
- Conditions of approvals, licences and permits to meet statutory requirements.
- Details of potential environmental impacts and operational control measures that are to be implemented including:
 - . Heritage.
 - . Preservation of visual values.
- Details of environmental protection for each activity.
- Locations of environmental controls and environmentally sensitive areas.
- Communication procedures.
- Emergency response procedures including response time.
- Environmental training plan and procedures.
- Environmental auditing program.
- Other items necessary to protect the surrounding environment.

Address the phases of activity, as appropriate:

- Before construction and site establishment.
- During construction.
- After construction, including rehabilitation activities and maintenance of erosion and sedimentation controls.

Completed environmental management plan: Submit before work commences on site.

Soil erosion and sediment control plan

Submit a soil erosion and sediment control plan and include the following details:

- Staging of operations and sequence of works.
- Diversion of upstream water around the site.
- Provision of temporary drains and catch drains.
- Application of diversion, dispersal and/or retention measures to concentrate flows to control and dissipate stormwater through the site without damage.
- Spreader banks or other structures to disperse concentrated runoff.
- Temporary grassing or other treatments such as contour ploughing or bunding to disturbed areas and long-term stockpiles.
- Restoration of disturbed areas in progress with the works.
- Use of mulch materials to protect disturbed or exposed areas where suitable.

Areas: Include all site areas and access and haulage tracks, borrow pits, stockpile and storage areas and compound areas.

Waste management plan

Submit a waste management plan and identify major waste streams that will be generated during the contract including:

- Green waste and organic waste.
- Construction waste, including:
 - . Spoil.
 - . Demolition waste.
 - . Asphalt or bitumen.
 - . Concrete
 - . Metal.
 - . Paint materials and empty containers.
 - . Office waste.
 - . Kitchen waste.
 - . Sewage effluent.
- For each waste stream indicate:

- How and where the waste is to be re-used, recycled, stockpiled or disposed off.
- How the waste will be transported between the site and point of re-use, recycling, stockpiling, treating or disposal and who will be responsible.

Submit details of location, labelling and protection of separate skips for the identified waste stream.

Ground contamination control plan

Submit a ground contamination plan and include the following details:

- If the land is identified as contaminated, or the presence of acid sulphate soils is found, prepare a Remediation Action Plan (RAP) in accordance with the Environmental Protection Authority (EPA) guidelines.

Weed management plan

Details required:

- Identify weeds and infestation zones within the work site/investigation date.
- Method of cleaning vehicles and machinery and cleaning date.
- Cleaning bay location and treatment date.
- Contaminated fill stockpile, treatment type and treatment date.

Site preparation

Mulching: Submit details of provisions for mulching cleared vegetation.

Internal monitoring

Documents: Provide documented procedures describing:

- How environmental monitoring is to be planned, implemented and recorded.
- Non-conformance control and corrective action procedures for all of the control measures that are to be implemented.

Records: Maintain records of the results of environmental monitoring, including the effectiveness of any remedial action taken.

Internal monitoring personnel: Provide staff member's names and contact details.

Machinery and equipment: Provide details of proposed plant.

Emergency response

Emergency response personnel: Provide staff member's names and contact details.

Response time: 24 hour notice

Penalty for failure to respond: non-conformance

Weed management personnel

Submit details of:

- Subcontractors who will treat weed infestations.
- Chemical handlers, qualifications, date, and spray type.

1.5 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Enclosures to trees to be retained.
- Trees to be removed.

2 EXECUTION

2.1 GENERAL

Community liaison

General: Notify residents about new or changed construction activities which will affect access to, or disrupt the use of, their properties.

Notice: 5 working days unless the work is of an urgent nature with safety implications.

Notification content:

- The nature of the work.
- The reason for it being undertaken.

- The expected duration.
- Changes to traffic arrangements and property access.
- The 24-hour contact number of the responsible representative.

Legislative requirements

Conditions of Development Approval relevant to environment controls.

Environmental Impact Statement issues relevant to environment controls.

Complaints

Report: Within 1 working day of receiving a complaint about any environmental issue, including pollution, submit a written report detailing the complaint and action taken.

Register: Keep a register of all environmental complaints and action taken.

Cultural heritage

Training: Ensure that all personnel working on site have received training relating to their responsibilities regarding cultural heritage and are made aware of any sites/areas, which must be avoided. Identify such sites/areas on a site map and make available to all relevant personnel during the works.

Notice: Give notice if any item is encountered which is suspected to be an artefact of heritage value or any relic or material suspected of being of Aboriginal or early settlement origin.

Action: Stop construction work that might affect the item and protect the item from damage or disturbance.

Clearances

If required obtain clearances from appropriate authorities depending on individual projects.

2.2 CONTROL AND PROTECTION**Air quality control**

General: Protect adjoining owners, residents and the public against dust, dirt and water nuisance and injury. Use dust screens and watering to reduce the dust nuisance.

Lighting of fires

Prohibition: Do not light fires.

Noise control and vibration

Monitoring: Measure vibration levels of the peak particle velocity to AS 2187.2.

Limits: Do not exceed the vibration or airblast overpressure recommended in AS 2187.2 Appendix J.

Dust control

Dust must be controlled onsite by appropriate means

Vegetation and fauna

Wild life protected: All native.

Trees to be removed: Inspect to establish if nesting native fauna are present. If present give notice.

Pruning: To AS 4373.

Water quality

Wash out: Ensure that wash out does not enter waterways or stormwater drains.

Cross connection: Ensure that there are no cross connections between the stormwater and the public sewerage system.

Dewatering

General: Keep groundworks free of water. Provide and maintain slopes, crowns and drains on excavations and embankments to ensure free drainage. Place construction, including fill, masonry, concrete and services, on ground from which free water has been removed. Prevent water flow over freshly laid work.

2.3 TRUCK CONTAMINATION**Truck contamination precautions**

Covers: Use tarpaulins to prevent the dropping of materials on public roads.

Washing: Wash the underside of all vehicles leaving the site as follows:

- Mud: Do not carry mud on to adjacent paved streets or other areas.

- Noxious plants: If noxious plants, as designated by the Local Authority, are present on the site ensure seeds are not carried on to adjacent paved streets or other areas.

2.4 MANAGEMENT AND CONTROL PLAN IMPLEMENTATION

Approval

Project Superintendent will approve the Project Management and Control Plan

Implementation

General: Implement the following approved management and control plans:

- Environmental management control plan.
- Soil erosion and sediment control plan.
- Air quality control plan.
- Waste management plan.
- Ground contamination plan.
- Weed management plan.

Reporting

General: Compile the environment management plan (EMP) reports regularly to report the progress in relation to:

- Performance against statutory requirements.
- Performance against the EMP and the EMP policy, ecologically sustainable development outcomes and targets.
- Summary of monitoring, inspection and audits.
- Summary of reports required to meet the statutory requirements.
- Summary of environmental emergencies, incidents, non-compliance and complaints.

2.5 TEMPORARY LANDSCAPE FENCING

Fence dimensions

Height: 1200 mm.

Maximum post spacing: 5000 mm.

Components sizes

Corner and gate posts: Hardwood or preservative-treated softwood, 250 mm diameter.

Intermediate posts: Star picket.

Gate: Provide a suitable hinged gate with a gate latch.

Wire: Top, intermediate and bottom rows of 3.2 mm plain galvanized steel wire. Thread the top wire through pieces of plastic tube and through corner posts.

Removal

Completion: Remove the fence at the end of the planting establishment period.

2.6 TREE PROTECTION

General

Warning sign: Display a sign in a prominent position at each entrance to the site, warning that trees and plantings are to be protected during the contract. Remove on completion.

Lettering: Road sign type sans serif letters, 100 mm high, in red on a white background, to AS 1744.

Protection measures program: Before commencement of earthworks.

Trees to be retained

Extent: All trees NOT marked for removal.

Tree protection

Tree enclosures: Provide temporary protective enclosures as requested by the Project Superintendent

Work near trees

Harmful materials: Keep the area within the dripline free of sheds and paths, construction material and debris. Do not place bulk materials and harmful materials under or near trees. Do not place spoil from excavations against tree trunks. Prevent wind-blown materials such as cement from harming trees and plants.

Damage: Prevent damage to tree bark. Do not attach stays and guys to trees.

Work under trees: Do not remove topsoil from, or add topsoil to, the area within the dripline of the trees.

Excavation: If excavation is required near trees to be retained, give notice and obtain instructions. Open up excavations under tree canopies for as short a period as possible.

Hand methods: Use hand methods to locate, expose and cleanly remove the roots on the line of excavation. If it is necessary to excavate within the drip line, use hand methods such that root systems are preserved intact and undamaged.

Roots: Do not cut tree roots exceeding 50 mm diameter. Where it is necessary to cut tree roots, use means such that the cutting does not unduly disturb the remaining root system. Immediately after cutting, water the tree and apply a liquid rooting hormone to stimulate the growth of new roots.

Backfilling: Backfill to excavations around tree roots with a mixture consisting of three parts by volume of topsoil and one part of well rotted compost with a neutral pH value, free from weed growth and harmful materials. Place the backfill layers, each of 300 mm maximum depth, compacted to a dry density similar to that of the original or surrounding soil. Do not backfill around tree trunks to a height greater than 200 mm above the original ground surface. Immediately after backfilling, thoroughly water the root zone surrounding the tree.

Compacted ground: Do not compact the ground or use skid-steel vehicles under the tree dripline. If compaction occurs, give notice and obtain instructions.

Compaction protection: Protect areas adjacent the tree dripline. Submit proposals for an elevated platform to suit the proposed earthworks machinery.

Watering: Water trees as necessary, including where roots are exposed at ambient temperature > 35°C.

Mulching: Spread 100 mm thick organic mulch to the whole of the area covered by the drip line of all protected trees.

2.7 EXISTING SERVICES

Marking

General: Before commencing earthworks, locate and mark existing underground services in the areas which will be affected by the earthworks operations including clearing, excavating and trenching.

Excavation

General: Do not excavate by machine within 1 m of existing underground services.

Location: DIAL 1100 BEFORE YOU DIG is a free service, from anywhere in Australia, of locating underground pipe and cables (possible within two working days). See www.dialbeforeyoudig.com.au.

2.8 TREES TO BE REMOVED

Designation

Marking: Mark trees and shrubs to be removed as follows:

- *Tags: White ribbon*
- *Location: 1000 mm above ground level.*

2.9 SITE CLEARING

Clearing and grubbing

Clearing: Remove everything on or above the site surface, including rubbish, scrap, grass, vegetable matter and organic debris, scrub, trees, timber, stumps, boulders and rubble.

Grubbing: Grub out stumps and roots over 75 mm diameter to a minimum depth of 500 mm below subgrade under buildings, embankments or paving, or 300 mm below finished surface in unpaved areas. Backfill holes remaining after grubbing with sand material to prevent ponding of water. Compact the material to the relative density of the existing adjacent ground material.

Old works: Remove old works, including slabs, foundations, pavings, drains and manholes found on the surface.

2.10 SEDIMENT FILTERS

General

Inspection: For displacement, undercutting, over-topping and soil buildup, after each rain event. Effect repairs immediately.

Removal: When the upslope areas have been permanently stabilised.

Straw bale filters

Description: Temporary structures made of straw bales (cereal straw) laid end to end across direction of stormwater flow in order to filter sediment.

Slopes: If filter is at toe of a slope, place bales 1500 – 2000 mm away from slope, to provide access for maintenance and to allow coarse sediment to drop out of suspension before reaching sediment filter.

Binding: Wire-bound or with string-tied bindings wrapped around the bale sides.

Installation:

- Trench: 100 mm deep trench the width of a bale and the length of the proposed sediment filter.
- Placing: Lengthwise in the trench with ends tightly abutting and corners lapped.
- Fixing: Drive two 50 x 50 mm wooden stakes or metal star pickets through each bale. Ensure bales are packed closely and staked securely. Eliminate gaps with loose straw wedged between tight.

Backfilling: Compacted excavated soil to ground level on downhill side of barrier, and 100 mm above ground level on the uphill side of the bales.

Silt fence

Description: A temporary barrier of geotextile filter fabric, supported on wire or mesh fencing in order to filter sediment from stormwater flow.

Slopes: If filter is at toe of a slope, locate fence 1500 – 2000 mm away from slope, to provide access for maintenance and to allow coarse sediment to drop out of suspension before reaching sediment filter.

Contours: Locate fence line and posts along contours curving upstream at the sides to direct flow toward middle of the fence.

Installation:

- Trench: 100 mm wide x 200 mm deep along line of posts and upslope from barrier.
- Posts: 1200 mm long pre drilled steel star picket posts at 3000 mm centres, driven 600 mm and fitted with plastic safety caps.
- Wire mesh: ≥ 14 gauge x ≤ 150 mm mesh spacing. Fasten wire mesh to upslope side of posts with 25 mm long heavy-duty wire staples and tie wire. Extend wire mesh 150 mm into trench.
- Filter fabric: Geotextile filter fabric selected to suit local soil conditions cut from a continuous roll to minimise joints.
- Fixing fabric: Wire ties to the uphill side of fence posts, and extended 200 mm into the trench. Do not staple fabric onto trees.
- Fabric joints: 150 mm overlap at a support post, with both ends fastened to the post.

Performance: Retain soil found on site but with openings large enough to permit drainage and prevent clogging.

Fence height: 600 mm average.

Backfilling: Backfill trench over toe of fabric and compact soil.

Straw bale - geotextile filters

Description: Sediment filter comprising straw bales and geotextile filter fabric.

Slopes: If filter is at toe of a slope, place bales 1500 – 2000 mm away from slope, to provide access for maintenance and to allow coarse sediment to drop out of suspension before reaching sediment filter.

Binding: Wire-bound or with string-tied bindings wrapped around the bale sides.

Bale installation:

- Trench: 100 mm deep trench the width of a bale and the length of the proposed sediment filter.
- Placing: Lengthwise in the trench with ends tightly abutting and corners lapped.

- Fixing: Drive two 50 x 50 mm wooden stakes or metal star pickets through each bale. Ensure bales are packed closely and staked securely. Eliminate gaps with loose straw wedged between tight.

Filter fabric installation:

- Geotextile filter fabric selected to suit local soil conditions cut from a continuous roll to minimise joints.
- Fixing fabric: Staple filter fabric to top of straw bale and extend down the uphill face of the bale into the trench. Stretch the fabric and peg securely into the subgrade.
- Fabric joints: 150 mm overlap at a support post, with both ends fastened to the post.

Performance: Retain soil found on site but with openings large enough to permit drainage and prevent clogging.

Backfilling: Compacted excavated soil to ground level on downhill side of barrier, and 100 mm above ground level on the uphill side of the bales against and over toe of the fabric.

2.11 DISPOSAL OF MATERIALS

Disposal

Spoil: Remove cleared and grubbed material from the site and dispose of legally.

Burial: Bury concrete and other inorganic fragments as follows:

- Location: Beyond built or paved areas.
- Depth: > 600 mm from finished ground level to the top of the object.
- Compaction: Eliminate voids.

Mulch

Seed free aerial vegetative matter: Put through a chipper. Reduce to pieces not larger than 75 x 50 x 15 mm and stockpile for re-use as mulch.

Material not permitted: Leaf matter and tree loppings from privet, camphor laurel, coral tree, poplar, willow and noxious weeds.

2.12 COMPLETION

Temporary works

All temporary works needs to be made good upon completion of the project.

Joining up

Abutments: Join new and existing work including cutting if required, in the manner appropriate to the materials and make good to existing work.

2.13 CLEANING UP

Siteworks generally

Progressive cleaning: Keep the work under the contract clean and tidy as it proceeds and regularly remove from the site rubbish and surplus material arising from the execution of the work including any work performed during the Defects Liability Period or the Plant Establishment Period.

Removal of plant: Within fourteen days of the date of Practical Completion, remove Temporary Works, Construction Plant, buildings, workshops and equipment not forming part of the Works, except such as are required for work during the Defects Liability Period or the Plant Establishment Period which shall be removed on completion of that work.

2.14 VERMIN

Vermin management

Requirement: Employ an approved firm of pest exterminators and provide a certificate from the firm stating that the completed building is free of vermin.

0222B EARTHWORK

1 GENERAL

1.1 CROSS REFERENCES

General

General: Conform to the *General requirements* worksection.

Associated worksections

Associated worksections: Conform to the following:

- *Site management*.

1.2 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given below apply.

- Standard: To AS 1348.
- Description and classification of soils: To AS 1726.
- Site classification: To BCA clause 3.2.4.
- Bad ground: Ground unsuitable for the purposes of the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is or becomes soft, wet or unstable.
- Base: One or more layers of material usually constituting the uppermost structural element of a pavement and on which the surfacing may be placed, which may be composed of fine crushed rock, natural gravel, broken stone, stabilised material, asphalt or Portland cement concrete.
- Discrepancy: A difference between contract information about the site and conditions encountered on the site, including but not limited to discrepancies concerning the following:
 - . The nature or quantity of the material to be excavated or placed.
 - . Existing site levels.
 - . Services or other obstructions beneath the site surface.
- Line of influence: A line extending downward and outward from the bottom edge of a footing, slab or pavement and defining the extent of foundation material having influence on the stability or support of the footings, slab or pavement.
- Rock: Monolithic material with volume greater than 0.5 m³ which cannot be removed until broken up either by explosives or by rippers or percussion tools.
- Site topsoil: Soil excavated from the site which contains organic matter, supports plant life, conforms generally to the fine to medium texture classification of AS 4419 (loam, silt, clay loam) and is free from:
 - . Stones > 25 mm diameter.
 - . Clay lumps > 75 mm diameter.
 - . Weeds and tree roots > 75 mm.
 - . Sticks and rubbish.
 - . Material toxic to plants.
- Subbase: The material laid on the subgrade below the base either for the purpose of making up additional pavement thickness required, to prevent intrusion of the subgrade into the base, or to provide a working platform.
- Subgrade: The trimmed or prepared portion of the formation on which the pavement or slab is constructed. Generally taken to relate to the upper line of the formation.

1.3 GEOTECHNICAL AND ENVIRONMENTAL -SITE INVESTIGATION

Report

A geotechnical and environmental site investigation report will be provided on a project by project basis.

1.4 RECORDS OF MEASUREMENT

Excavation and backfilling

Agreed quantities: If a schedule of rates applies, provisional quantities are specified, or there are variations to the contract levels or dimensions of excavations, do not commence backfilling or place permanent works in the excavation until the following have been agreed and recorded:

- Depths of excavations related to the datum.
- Final plan dimensions of excavations.
- Quantities of excavations in rock.

Method of measurement: To be by registered surveyor unless otherwise agreed.

Rock

Level and class: If rock is to be measured for payment purposes, whether as extra over excavation of material other than rock or for adjustment of provisional measurements, do not remove the rock until the commencing levels and the classes of rock have been determined.

1.5 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Items to be measured as listed in Records of measurement.
- Areas to be cleared and/or stripped of topsoil.
- Areas stripped of topsoil.
- Excavation completed to contract levels or founding material.
- Proof roll subgrade prior to placing fill.
- Filling completed to contract levels.
- Stockpiled topsoil before spreading.

1.6 TESTS

Testing will be requested on a project basis and will be ordered by the Project Superintendent.

Imported fill tests

Testing will be requested on a project basis and will be ordered by the Project Superintendent.

1.7 SUBMISSIONS

Tests

Imported fill: Submit certification or test results which establish the compliance of imported fill with the contract.

Compaction: Submit certification and/or test results in accordance with the specified level of responsibility to AS 3798.

Materials

General: Submit details of materials proposed, including the following:

- Sources of imported fill.

1.8 TOLERANCES

Tolerances

Finish: Finish the surface to the required level, grade and shape within the following tolerances:

- Under building slabs and loadbearing elements: + 0, - 25 mm.
- Pavement subgrades; + 0, - 40 mm.
- Batters: No steeper than the slope shown on the drawings. Flatter slopes shall not impact on boundaries or required clearances to buildings, pavements or landscaping.

- Other ground surfaces: ± 50 mm, provided the area remains free draining and matches adjacent construction where required. Provide smoothness as normally produced by a scraper blade.

2 PRODUCTS

2.1 FILL MATERIALS

Fill material generally

General: Inorganic, non-perishable material.

Sulphur content: Do not provide filling with sulphur content exceeding 0.5 % within 500 mm of cement bound elements (for example concrete structures or masonry) unless such elements are protected by impermeable membranes or equivalent means.

Excluded materials:

- Organic soils.
- Materials contaminated through past site usage.
- Materials which contain substances which can be dissolved or leached out, or which undergo volume change or loss of strength when disturbed and exposed to moisture.
- Silts or silt-like materials.
- Fill containing wood, metal, plastic, boulders or other deleterious material.

Site based material

'Permitted' or 'Not permitted' based on advice from the geotechnical and environmental engineer.

Excavated material may not be suitable for re-use where it is contaminated or possesses problematic geotechnical properties.

Imported fill

All imported materials must be certified to be clean from any foreign matters.

3 EXECUTION

3.1 REMOVAL OF TOPSOIL

General

Extent: Areas to be cut and areas to be filled and areas to be occupied by structures, pavements, embankments and the like.

Maximum depth: 200 mm.

Re-use of removed topsoil

The reuse of removed topsoil shall be approved by the Project Superintendent

3.2 EXCAVATION

Extent

Site surface: Excavate over the site to give correct levels and profiles as the basis for structures, pavements, filling and landscaping. Make allowance for compaction or settlement.

Footings: Excavate for footings, pits, wells and shafts, to the required sizes and depths. Confirm that bearing capacity is adequate.

Crawl space: Provide clear space under timber floor bearers.

- Minimum clearance: 400 mm.

Disposal of excess excavated material

General: Remove excess excavated material from the site and dispose of legally.

3.3 BEARING SURFACES

General

General: Provide even plane bearing surfaces for loadbearing elements including footings. Step to accommodate level changes. Make the steps to the appropriate courses if supporting masonry.

3.4 REINSTATEMENT OF EXCAVATION

General

Requirement: If the excavation exceeds the required depth, or deteriorates, reinstate to the correct depth, level and bearing value.

3.5 SUPPORTING EXCAVATIONS

Removal of supports

General: Remove temporary supports progressively as backfilling proceeds.

Voids

General: Guard against the formation of voids outside sheeting or sheet piling if used. Fill and compact voids to a dry density similar to that of the surrounding material.

3.6 ADJACENT STRUCTURES

Temporary supports

General: Provide supports to adjacent structures where necessary, sufficient to prevent damage arising from the works.

Lateral supports: Provide lateral support using shoring.

Vertical supports: Provide vertical support where necessary using piling or underpinning or both.

Permanent supports

General: If permanent supports for adjacent structures are necessary and are not described, give notice and obtain instructions.

3.7 PREPARATION FOR FILLING

General

General: Prepare the ground surface before placing fill (including topsoil fill), ground slabs or load bearing elements. Shape to assist drainage. Remove materials which will inhibit or prevent satisfactory placement of fill layers, loose material, debris and organic matter. Compact the ground exposed after stripping or excavation in conformance with the Compaction schedule.

3.8 PLACING FILL

General

Layers: Place fill in near-horizontal layers of uniform thickness, deposited systematically across the fill area.

Extent: Place and compact fill to the designated dimensions, levels, grades, and cross sections so that the surface is always self draining.

Edges: At junctions of fill and existing surfaces, do not feather the edges.

Mix: Place fill in a uniform mixture.

Previous fill: Before placing subsequent fill layers, ensure that previously accepted layers still conform to requirements, including moisture content.

Protection: Protect the works from damage due to compaction operations. Where necessary, limit the size of compaction equipment or compact by hand. Commence compacting each layer at the structure and proceed away from it.

Protective covering: Do not disturb or damage the protective covering of membranes during backfilling.

3.9 PLACING TOPSOIL

Stockpiled topsoil

Cultivation: Rip to a depth of 100 mm or to the depth of rippable subgrade if less. Cultivate around services and tree roots by hand. Trim to allow for the required topsoil depth.

Herbicide: Apply before placing topsoil.

Herbicide product: To be provided by the Principal

Placing: Spread and grade evenly.

Disposal of excess topsoil

On site: Dispose of surplus topsoil remaining on site by spreading evenly over the areas already placed.

Off site: Remove excess topsoil from the site and dispose of legally.

Compaction: Lightly compact topsoil so that the finished surface is smooth, free from lumps of soil, at the required level, ready for cultivation and planting.

Edges: Finish topsoil flush with abutting kerbs, mowing strips and paved surfaces. Feather edges into adjoining undisturbed ground.

3.10 COMPACTION REQUIREMENTS FOR FILL AND SUBGRADE**Density**

General: Other than rolled fill to AS 2870 clause 6.4.2(b). Compact the subgrade and each layer of fill to the required depth and density, as a systematic construction operation and to conform to the Compaction table. Shape surfaces to provide drainage and prevent ponding.

Compaction table

Location	Cohesive soils. Minimum dry density ratio (standard compaction) to AS 1289.5.4.1	Cohesionless soils. Minimum density index to AS 1289.5.6.1
Residential: - Lot fill, house sites.	95	70
Commercial: - Fills to support minor loadings incl. floor loadings < 20 kPa and isolated pad or strip footings < 100 kPa.	98	75
Pavements: Fill to support pavements Subgrade to 300 mm deep	95 98	70 75

Excavated and stripped ground surface: After excavation and/or stripping, compact these surfaces in conformance with the Compaction table to a minimum depth of 150 mm.

Maximum rock and lump size in layer after compaction: 2/3 compacted layer thickness.

Fill batter faces: Either compact separately, or overfill and cut back. Form roughened surfaces to the faces.

Moisture content

General: Adjust the moisture content of fill during compaction within the range of 85 – 115 % of the optimum moisture content determined by AS 1289.5.1.1 or AS 1289.5.2.1 as appropriate, in order to achieve the required density.

3.11 COMPLETION**Temporary works**

Tree enclosures: Remove temporary tree enclosures at completion.

Tree marking: Remove temporary marks and tags at completion.

Temporary supports: Remove temporary supports to adjacent structures at completion.

0224B STORMWATER

1 GENERAL

1.1 RESPONSIBILITIES

General

Selections: Conform to the Selections.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General requirements.*

1.3 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given below apply.

- Pipe surround: Includes pipe overlay, pipe side support, side zone and haunch zone.

1.4 STANDARDS

Stormwater drainage

Standard: To AS/NZS 3500.3.

1.5 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Excavated surfaces prior to placing pipe bedding material.
- Formwork and reinforcement prior to placing cast in situ concrete.
- Pipe joints prior to covering.
- Placing of cast in situ concrete.
- Upon completion.

2 PRODUCTS

2.1 MATERIALS

Joints

Solvent cement and priming fluid: To AS/NZS 3879.

Pipe and fittings

Fibre reinforced cement (FRC): To AS 4139.

- < 450 mm diameter: Pre-socketed at one end with a factory fitted Adcol coupling.
- > 450 mm diameter: To have a purpose machined internal spigot and socket system within the pipe wall.

Glass-reinforced polyester (GRP): To AS 3571.1.

Cast iron manhole covers and frames: To AS 1830 and AS 1831 as appropriate.

Polyvinyl chloride (PVC): To AS 1254, AS/NZS 1260, AS 1273.

Polyethylene (PE): To AS/NZS 4129, AS/NZS 4130, ISO 8770, or AS/NZS 2033.

Precast concrete: To AS/NZS 4058.

Rubber ring joints/elastomeric seals: To AS 1646.

Subsoil: To AS 2439.1.

Vitrified clay or ceramic: To AS 1741.

Bedding material

Bedding material for the bed and haunch zones: A granular material having a grading determined by AS 1141.

Conformance: Comply with the **Bedding material grading table**.

Bedding material grading schedule

Sieve size (mm)	Weight passing %	
	Bed and haunch	Side zones
75.0	-	100
19.0	100	-
9.5	-	50-100
2.36	50-100	30-100
0.60	20-90	15-50
0.30	10-60	-
0.15	0-25	-
0.075	0-10	0-25

3 EXECUTION

3.1 STORMWATER DRAINS

Location

General: Provide stormwater drains to connect downpipes, surface drains, subsoil drains and drainage pits to the outlet point or point of connection. Make sure that location of piping will not interfere with other services and building elements not yet installed or built. Subject to the preceding and documented layouts, follow the most direct route with the least number of changes in direction.

Downpipe connections: Turn up branch pipelines with bends to meet the downpipe, finishing 50 mm (nominal) above finished ground or pavement level. Seal joints between downpipes and drains.

Laying

General: Lay in straight lines between changes in direction or grade with socket end placed upstream. If other pipes are adjacent, set each pipe true to line and complete each joint before laying the next pipe. If work is not continuous cap open ends to prevent entry of foreign matter.

Bedding

General: Grade the underlay evenly to the gradient of the pipeline.

Standard: In accordance with AS/NZS 3725 and AS/NZS 3725 Supplement 1.

Bedding type: [complete/delete]

Layers: Compact all material in layers not exceeding 150 mm compacted thickness.

Trench backfill

General: Backfill the remainder of the trench to the underside of the subgrade with fill material in accordance with the *Earthwork* worksection.

Anchor blocks

General: If necessary to restrain lateral and axial movement of the stormwater pipes provide anchor blocks at junctions and changes of grade or direction.

Encasement

General: Conform to the **Stormwater pipeline schedule**.

Location: Encase the pipeline in concrete at least 150 mm above and below the pipe, and 150 mm each side or the width of the trench, whichever is the greater.

3.2 SUBSOIL DRAINS

General

General: Provide subsoil drains to intercept groundwater seepage and prevent water build-up behind walls and under floors and pavements. Connect subsoil drains to surface drains or to the stormwater drainage system as applicable. Conform to the **Subsoil pipeline schedule**.

Trench width: ≥ 450 mm.

Pipe depth: Provide the following minimum clear depths, measured to the crown of the pipe, where the pipe passes below the following elements:

- 100 mm below subgrade level of the pavement, kerb or channel.
- 100 mm below the average gradient of the bottom of footings.
- 450 mm below the finished surface of unpaved ground.

3.3 PITS

Finish to exposed surfaces

General: Provide a smooth, seamless finish, using steel trowelled render or concrete cast in steel forms.

Corners: Cove or splay internal corners.

Metal access covers and grates

Standard: To AS 3996.

Cover levels: Top of cover or grate, including frame:

- In paved areas: Flush with the paving surface.
- In landscaped areas: 25 mm above finished surface.
- Gratings taking surface water runoff: Locate to receive runoff without ponding.

3.4 TESTING

Pre-completion tests

General: Before backfilling or concealing, carry out the following tests:

- Site stormwater drains and main internal drains: Air or water pressure test to AS 3500.3 Section 10.

Leaks: If leaks are found, rectify and re-test.

3.5 COMPLETION

Cleaning

General: Clean and flush the whole installation.

4 SELECTIONS

4.1 STORMWATER

Stormwater pipeline schedule

Refer to drawings

0251 LANDSCAPE – SOILS

1 GENERAL

1.1 RESPONSIBILITIES

General

Selections: Conform to the Selections.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General requirements.*
- *Stormwater – site.*
- *Earthwork.*

1.3 STANDARDS

Soils

Site and imported topsoil: To AS 4419.

Potting mixes: To AS 3743.

Composts, soil conditioners and mulches: To AS 4454.

1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given below apply.

- Bad ground: Ground unsuitable for the purposes of the works, including fill liable to subsidence, ground containing cavities, faults or fissures, ground contaminated by harmful substances and ground which is or becomes soft, wet or unstable.
- Site rock: Rocks selected for salvage.
- Site topsoil: Soil excavated from the site which contains organic matter, supports plant life, conforms generally to the fine to medium texture classification to AS 4419 (loam, silt, clay loam) and is free from:
 - . Stones > 25 mm diameter.
 - . Clay lumps > 75 mm diameter.
 - . Weeds and tree roots.
 - . Sticks and rubbish.
 - . Material toxic to plants.
- Imported topsoil: Similar to naturally occurring local topsoil, suitable for the establishment and on going viability of the selected vegetation, free of weed propagules and of contaminants, and classified by texture as follows to AS 4419 Appendix I:
 - . Fine: Clay loam, fine sandy loam, sandy clay loam, silty loam, loam.
 - . Medium: Sandy loam, fine sandy loam.
 - . Coarse: Sand, loamy sand.
- Low density soil: Soil for use on an artificial base material, e.g. roof top garden or large landscape containers. Such soils will usually be blends of mineral and organic compounds, and will typically have:
 - . Bulk density: 0.3 to 0.6 kg/L.
 - . Organic matter: 10 % to 40 % by mass.
- Natural soil: A soil that has been dug from the landscape and is presented for use with no more than minor amendment. This soil could be topsoil, subsoil or a mixture of them and have a bulk density > 0.7 kg/L.

- Organic soil: A general purpose soil (normally an amended natural soil or soil blend) that has:
 - . Bulk density: > 0.6 kg/L.
 - . Organic matter: 15 % to 25 % by mass.
- Soil blend: A general purpose soil derived from the blending of two or more of sand, natural soil material or organic materials and has:
 - . Bulk density: > 0.7 kg/L.
 - . Organic matter: 3 % to 5 % by mass.
- Top dressing: A soil which is suitable for surface application to lawn.

1.5 SITE INVESTIGATION

1.6 GEOTECHNICAL REPORT

Any geotechnical site investigation report provided is for information only. The geotechnical information and information on contaminants given is information on the nature of the ground at each tested part. It is not a complete description of conditions existing at or below ground level.

Notice

If the following are encountered, give notice immediately and obtain instructions before carrying out any further work in the affected area:

- Bad ground.
- Discrepancies.
- Rock.
- Springs, seepages.
- Topsoil > 100 mm deep.

1.7 INSPECTION

Notice

Inspection: Give notice so inspection may be made of the following:

- Setting out completed.
- Subgrades cultivated or prepared for placing topsoil.
- Topsoil spread before planting.
- Grassing bed prepared before turfing, seeding, or temporary grassing.

1.8 TESTS

Soil tests

General: To AS 4419, Table 1.

Sampling: As recommended in AS 4419 Appendix A.

Laboratory: NATA registered.

Imported topsoil tests: Submit the results of type tests to AS 4419 Appendix B to I (topsoil), or AS 3743 Appendix D to G (potting mixes), as applicable.

Site topsoil tests: To AS 4419 Appendix C to I.

1.9 SUBMISSIONS

The Project Superintendent may request any of the following tests to be carried out depending on individual projects:

Soil tests for imported topsoil

Report: Submit a certificate noting the:

- Suitability of each soil type for its specified use.
- Similarity to naturally occurring local soil.
- Suitability for establishment and on-going viability of the site specified vegetation.
- Absence of any weed propagules or contaminants.

Ameliorants recommendation: If required to include ameliorants, recommend the source of ameliorant material, rates and methods of incorporation.

Soil tests for site topsoil

Report: Submit a certificate noting the:

- Suitability of the soil for its specified use.
- Suitability for establishment and on-going viability of the site specified vegetation.
- Presence of any weed propagules or contaminants.

Recommendation:

- Soil amelioration: If required to include ameliorants, the source of ameliorant material, rates and methods of incorporation.
- Purpose: Amelioration recommendations for the following:
 - . Bushland reconstruction areas.
 - . Planting on grade.
 - . Grass mixes.
- Weed eradication: Species and eradication method.
- Contaminant removal.

Samples

General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content.

Bulk materials: Submit a 5 kg sample of each type specified. Submit bulk material samples, with required test results, at least 5 working days before bulk deliveries.

Suppliers

Statements: Submit statements from suppliers of soils and other materials, giving the following, where applicable:

- Particulars of the supplier's experience in the required type of work.
- Production capacity for material of the required type, sizes and quantity.
- Lead times for delivery of the material to the site.

Materials

Supplier's data: Submit supplier's data including the following:

- Material source of supply for topsoil, filling, stone and filter fabrics.

Compost: Submit a certificate of proof of compost pH value.

Execution

Program: Submit a work program in the form of a bar chart, for the landscape works.

2 PRODUCTS**2.1 TOPSOIL****Source**

General: Import topsoil to the **Selections** unless the topsoil type can be provided from material recovered from the site.

General

Deliveries: Documentation to AS 4419, clause 8.

Additives: If using additives to raise topsoil to the required standard, ensure compliance with the relevant test criteria of AS 4419.

Nitrogen drawdown: If the NDI_{150} value is < 0.5 to AS 4419 Appendix E add a source of soluble nitrogen to bring the value above zero.

Compost: Provide well rotted vegetative material or animal manure, free from harmful chemicals, grass and weed growth to the organic content by mass noted in the **Selections**.

Imported topsoil

Recycled content: [complete/delete]

Particle size: Provide soil to the **Particle size table** for the textures nominated in **Selections**.

Topsoil particle size table (% passing by mass)

AS sieve aperture to	Soil textures
----------------------	---------------

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

Nutrient levels: Provide soil to the **Topsoil nutrient level table**.

Topsoil nutrient level table

Type	Amount (mg/L)
Phosphorus (P)	0.7 – 4
Potassium (K)	35 – 250
Sulfur (S)	> 40
Calcium (Ca)	50 – 350
Nitrogen (N)	100
Manganese (Mn)	1 – 15

Site topsoil

General: Provide site topsoil to the **Selections**.

Soil blend: Stripped topsoil with ameliorants noted in **Submissions** to AS 4419 clause 4.6.

2.2 STRUCTURAL SOIL

Delete

3 EXECUTION

3.1 PREPARATION

Vegetative spoil

Remove vegetative spoil from site. Do not burn.

Embankment stabilisation

General: Where necessary to prevent erosion or soil movement, stabilise embankments.

Method: matting

Matting generally: Biodegradable fibre reinforced with lightweight polymer mesh. Provide lightweight material for seeding, medium or heavy weight material for planting.

Matting in high erosion zones: Flexible carbon black UV stabilised interwoven nylon mesh.

Matting installation: Sow before matting is installed, where sowing is required. Plant after matting is installed, where planting is required. Peg the matting into 300 x 300 mm anchor trenches at top and bottom, backfill the trenches with soil and compact.

Matting pegs: U-shape galvanized steel, at 1000 x 1000 mm intervals generally, 250 mm at overlaps.

3.2 ROCK WORK

Existing rock

General: Protect existing rock, rock shelves and rock outcrops from mechanical damage, surface defacement and other works.

Rock surfaces: Report damage or defacement occurring to any rock faces during the course of the Works.

Replacement: If restoration is not feasible repair the rock face with replaced rocks imported or taken from the site.

Planted treatment to rock faces*Delete***New rock work***Delete***3.3 EARTH MOUNDS****Construction**

Placing: Place clean filling in layers approximately 150 mm thick compacted to 85% of the dry density ratio of the surrounding soil as determined by AS 1289.5.4.1. Minimise slumping and further internal packing down.

Edges: Construct changes in grade over a minimum width of 500 mm to smooth, gradual and rounded profiles with no distinct joint.

Existing trees: Maintain the natural ground level under the canopy.

Pipes, culverts and associated structures: Construct mounding to avoid unbalanced loading.

3.4 SUBSOIL**Ripping**

General: Rip parallel to the final contours wherever possible. Do not rip when the subsoil is wet or plastic. Do not rip within the dripline of trees and shrubs to be retained.

Ripping depths: Rip the subsoil to the following typical depths:

- Compacted subsoil: 300 mm.
- Heavily compacted clay subsoil: 450 mm.

Planting beds

Excavated: Excavate to bring the subsoil to at least 300 mm below finished design levels. Shape the subsoil to fall to subsoil drains where applicable. Break up the subsoil to a further depth of 100 mm.

Unexcavated: Remove weeds, roots, builder's rubbish and other debris. Bring the planting bed to 75 mm below finished design levels.

Cultivation

Minimum depth: 100 mm.

Services and roots: Do not disturb services or tree roots; if necessary cultivate these areas by hand.

Cultivation: Thoroughly mix in materials required to be incorporated into the subsoil. Cultivate manually within 300 mm of paths or structures. Remove stones exceeding 25 mm, clods of earth exceeding 50 mm, and weeds, rubbish or other deleterious material brought to the surface during cultivation. Trim the surface to design levels after cultivation.

Additives

General: Apply additives after ripping or cultivation and incorporate into the upper 100 mm layer of the subsoil. Additives to be supplied by the Principal.

Gypsum: Incorporate at the rate of 0.25 kg/m².

Herbicide: Prior to spreading topsoil apply a herbicide treatment as follows:

- *Product: To be supplied by the Principal*
- *Location: To be advised by the Superintendent*

Site topsoil preparation*Delete***Placing topsoil**

Site topsoil: Do not incorporate site topsoil into the works until soil testing certification has been approved. Remove unauthorised material from the site.

General: Spread the topsoil on the prepared subsoil and grade evenly, making the necessary allowances to permit the following:

- Required finished levels and contours may be achieved after light compaction.
- Grassed areas may be finished flush with adjacent hard surfaces such as kerbs, paths and mowing strips.

Spreading: On steep batters, if using a chain drag, ensure there is no danger of batter disturbance.

Finishing: Feather edges into adjoining undisturbed ground.

Consolidation

General: Compact lightly and uniformly in 150 mm layers. Avoid differential subsidence and excess compaction and produce a finished topsoil surface which has the following characteristics:

- Finished to design levels.
- Smooth and free from stones or lumps of soil.
- Graded to drain freely, without ponding, to catchment points.
- Graded evenly into adjoining ground surfaces.
- Ready for planting.

Topsoil depths

General: Spread topsoil to the following typical depths:

- Excavated planting areas: If using organic mulch, 225 mm. If using gravel mulch, 250 mm.
- Irrigated grassed areas generally: 150 mm.
- Irrigated grassed areas, heavy use (e.g. playing fields, playgrounds, public parks): 200 mm.
- Non-irrigated grass areas: 100 mm.
- Earth mounds:
 - . Mass planted surfaces: 300 mm.
 - . Grassed surfaces: 100 mm.
- Top dressing: 10 mm.

Surplus topsoil

General: Spread surplus topsoil on designated areas on site, if any; otherwise, dispose off site.

Designated areas: To be advised by the Superintendent

3.5 STRUCTURAL SOIL

Delete

Construction

Delete

0252 LANDSCAPE – SOFT SURFACES

1 GENERAL

1.1 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General requirements.*
- *Site management.*
- *Earthwork.*
- *Landscape – soils.*

1.2 INSPECTION

Notice

Inspection: Give notice so inspection may be made of the following

- Clearing completed.
- Setting out completed.
- Grassing bed prepared before turfing, seeding, or temporary grassing.
- Grassing or turfing completed.

1.3 SUBMISSIONS

Samples

General: Submit representative samples of each material, packed to prevent contamination and labelled to indicate source and content.

Suppliers

Statements: Submit statements from suppliers, giving the following, where applicable:

- Particulars of the supplier's experience in the required type of work.
- Production capacity for material of the required type and quantity.
- Lead times for delivery of the material to the site.

Materials

Supplier's data: Submit supplier's data including the following:

- Material source of supply.

Execution

Program: Submit a work program in the form of a bar chart, for the landscape works.

Maintenance program: Submit a proposed planting maintenance program.

Material storage on site: Submit proposal.

2 PRODUCTS

2.1 GRASS

Turf

Supplier: Obtain turf from a specialist grower of cultivated turf.

Quality: Provide turf of even thickness, free from weeds and other foreign matter.

2.2 FERTILISER

ALL FERTILISER WILL BE SUPPLIED BY THE PRINCIPAL

3 EXECUTION

3.1 PREPARATION

Weed eradication

Herbicide: Eradicate weeds using environmentally acceptable methods, such as a non-residual glyphosate herbicide in any of its registered formulae, at the recommended maximum rate.

Manual weeding: Regularly remove, by hand, rubbish and weed growth throughout grassed, planted and mulched areas. Remove weed growth from an area 750 mm diameter around the base of the trees in grassed areas. Continue eradication throughout the course of the works and during the planting establishment period.

Vegetative spoil

Disposal: Remove vegetative spoil from site or as instructed by the Superintendent.

3.2 GRASS SEEDING

Delete

3.3 HYDROSEEDING AND HYDROMULCHING

Delete

3.4 TURFING

Supply

Elapsed time: Deliver the turf within 24 hours of cutting, and lay it within 36 hours of cutting. Prevent it from drying out between cutting and laying. If it is not laid within 36 hours of cutting, roll it out on a flat surface with the grass up, and water as necessary to maintain a good condition.

Laying

General: Lay the turf in the following manner:

- In stretcher pattern with the joints staggered and close butted.
- Parallel with the long sides of level areas, and with contours on slopes.
- To finish flush, after tamping, with adjacent finished surfaces of ground, paving edging, or grass seeded areas.

Strip turf laying: Close butt the end joints and space the strips 300 mm apart. Apply a layer of top dressing between the strips of turf. Finish with an even surface.

Tamping

General: Lightly tamp to an even surface immediately after laying. Do not use a roller.

Pegging

Stabilising: On steep slopes peg the turf to prevent downslope movement. Remove the pegs when the turf is established.

Fertilising

General: Mix the fertiliser thoroughly into the topsoil before placing the turf. Apply lawn fertiliser at the completion of the first and last mowings, and at other times as required to maintain healthy grass cover.

Watering

General: Water immediately after laying until the topsoil is moistened to its full depth. Continue watering to maintain moisture to this depth.

Mowing

Height: Mow to maintain the grass height within the required range. Do not remove more than one third of the grass height at any one time. Carry out the last mowing within 7 days before the end of the planting establishment period. Remove grass clippings from the site after each mowing.

Turfing

General: Lay turfing to the **Turfing schedule**.

Maintenance

General: Maintain turfed areas until the attainment of a dense continuous sward of healthy grass over the whole turfed area, evenly green and of a consistent height.

Failed turf: Lift failed turf and relay with new turf.

Levels: Where levels have deviated from the design levels after placing and watering, lift turf and regrade topsoil to achieve design levels.

Top dressing

General: When the turf is established mow, remove cuttings and lightly top dress to a depth of 10 mm. Rub the dressing well into the joints and correct any unevenness in the turf surface.

3.5 STOLONISING

Delete

3.6 TEMPORARY GRASSING

Delete

3.7 SYNTHETIC GRASS

Delete

0271 PAVEMENT BASE AND SUBBASE

1 GENERAL

1.1 RESPONSIBILITIES

General

General: Provide base and subbase courses that are as follows:

- In conformance with the level tolerances specified.
- Tested by a geotechnical testing authority.
- In conformance with the compaction requirements supplied.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General requirements.*
- *Site management.*
- *Earthwork.*
- *Stormwater – site.*
- *Pavement ancillaries.*

1.3 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given below apply.

- Standard: To AS 1348.
- Absolute level tolerance: Maximum deviation from design levels.
- Relative level tolerance: Maximum deviation from a 3 m straight edge laid on the surface.

1.4 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Prepared subgrade.
- Proof rolling of subbase prior to spreading of base.
- Proof rolling of base prior to sealing.

1.5 TESTS

Compaction control tests

Standard: To AS 1289.5.4.1 and AS 1289.5.4.2.

1.6 SUBMISSIONS

Frequency of compaction control tests

General: Not less than the following (whichever requires the most tests):

- 1 test per layer per 25 lineal metres for 2-lane roads.
- 1 test per layer per 1000 m² for carparks.
- 3 tests per layer.
- 3 tests per visit.

Source of material: State the supplier name, nature of material (crushed rock, natural gravel, recycled concrete aggregate) and source quarry or recycling site.

Compliance of material: Provide certification and test results from a NATA registered laboratory confirming that the material complies with the requirements of the specification.

Execution

General: Submit proposals for the methods and equipment to be used for the roadworks, including the following:

- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.
- Methods and equipment for each operation.
- Sources of materials.
- Material stockpiles.

Compaction: If it is proposed that a layer is to exceed 150 mm in thickness, submit evidence demonstrating that the proposed compaction equipment can achieve the required density throughout the layer.

2 PRODUCTS**2.1 TRAFFIC CATEGORY****Pavement and material traffic categories table**

Pavement materials are specified in terms of traffic categories defined below for the calculated design traffic of the pavement.

Pavement material traffic category	Description
1	Roads with design traffic $\geq 10^7$ equivalent standard axle (ESA) repetitions.
2a	Roads with design traffic $> 4 \times 10^6$ but $< 10^7$ ESAs.
2b	Roads with design traffic $> 10^6$ ESAs but \leq to 4×10^6 ESAs.
2c	Roads with design traffic $> 10^5$ ESAs but \leq to 10^6 ESAs.
2d	Roads with design traffic $\leq 10^5$ ESAs.

2.2 BASE AND SUBBASE MATERIAL**General**

Compliance: Comply with the **Base and subbase compliance table**.

Base and subbase compliance table

Course	Source	Compliance requirement
Base	Crushed rock or natural gravel	To the AUS-SPEC 1141 <i>Flexible pavements</i> worksection's Pavement material traffic categories table , Acceptable pavement material types table , and Unbound base material properties table
	Recycled concrete aggregate	To SAA HB 155 Table 19
Subbase	Crushed rock or natural gravel	To the AUS-SPEC 1141 <i>Flexible pavements</i> worksection's Pavement material traffic categories table , Acceptable pavement material types table , and Unbound subbase material properties table
	Recycled concrete aggregate	To SAA HB 155 Table 19

Granular material

Unbound materials, including blends of two or more different materials, shall consist of granular material which does not develop significant structural stiffness when compacted. Material produced by blending shall be uniform in grading and physical characteristics.

Crushed rock

Unbound crushed rock materials are designated as follows:

- DGB20: 20 mm nominal sized densely graded base.
- DGS20: 20 mm nominal sized densely graded subbase.
- DGS40: 40 mm nominal sized densely graded subbase.
- GMB20: 2 mm nominal sized graded macadam base.
- GMS40: 40 mm nominal sized graded macadam subbase.

Natural gravel

Unbound natural gravel materials are designated as follows:

- NGB20-2c: 20 mm nominal sized natural gravel base for Traffic Category 2c.
- NGB20-2d: 20 mm nominal sized natural gravel base for Traffic Category 2d.
- NGS20: 20 mm nominal sized natural gravel subbase.
- NGS40: 40 mm nominal sized natural gravel subbase.

Unbound base material properties table

Test method		Description		Base Material Requirements	
		DGB20	GMB20	NGB20-2c	NGB20-2d
AS 1289.3.6.1	Course Particle Size Distribution % passing 75.0 mm sieve % passing 53.0 mm sieve % passing 37.5 mm sieve % passing 26.5 mm sieve % passing 19.0 mm sieve % passing 13.2 mm sieve % passing 9.5 mm sieve % passing 6.7 mm sieve % passing 4.75 mm sieve % passing 2.36 mm sieve % passing 0.425 mm sieve % passing 0.075 mm sieve	— — — 100 95-100 — — 50-70 — 35-55 — —	— — — 100 95-100 — — 30-55 — 20-30 — —	— — — 100 93-100 — 71-87 — 47-70 35-56 14-32 6-20	— — — 100 93-100 — 71-87 — 47-70 35-56 14-32 6-20
AS 1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36 mm sieve)				
	A. Pass 425 µm sieve %	35-55	30-50	—	—
	B. Pass 75 µm sieve % Pass 425 µm sieve	35-55	30-50	—	—
	C. Pass 13.5 µm sieve % Pass 75 µm sieve	35-60	—	—	—
AS 1289.3.1.1	Liquid Limit (if non plastic)*	max 20	max 20	max 20	max 20
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	max 20	max 20
AS 1290.3.3.1	Plasticity Index I_p	max 6	max 6	max 6	max 8
T114	Maximum Dry Compressive Strength on fraction passing 19 mm sieve (only applies if Plastic Index is less than 1)	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa	min 1.7 MPa
AS 1141.14	Particle Shape by Proportional Calliper - % misshapen (2:1)	max 35	max 35	—	—
AS 1141.22	Aggregate Wet Strength θ				
	For category 1 or 2a For category 2b or 2c For category 2d	min 80 min 70 min 60	min 150 min 130 min 100	— — —	— — —

Test method		Description		Base Material Requirements	
		DGB20	GMB20	NGB20-2c	NGB20-2d
AS 1141.22	Wet/Dry Strength Variation θ				
	(Dry - Wet)/Dry) %				
	For category 1 or 2a For category 2b or 2c For category 2d	max 35 max 40 max 45	max 30 max 30 max 30	— — —	— — —
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	—	—	80	60

NOTES:

Material consisting of rounded riverstone shall have minimum of two fractured faces on at least 75% of the particles larger than 6.70 mm.

* The maximum value of the Liquid may be increased to 23 for non-plastic material, provided that the value determined is not influenced by the presence of adverse constituents.

Y For category 2d base materials the maximum Plasticity Index shall be 8.

θ All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0 mm to 13.2 mm and 6.7 mm to 4.75 mm must be tested. The other fractions do not need to be tested unless there is a risk in the opinion of the Superintendent that such fraction may fail the specification. Any fraction at risk of failing must be tested.

Unbound subbase material properties table

Test method	Description	Subbase Material Requirements				
		DGS20	DGS40	GMS40	NGS20	NGS40
AS 1289.3.6.1	Course Particle size Distribution % passing 75.0 mm sieve % passing 53.0 mm sieve % passing 37.5 mm sieve % passing 26.5 mm sieve % passing 19.0 mm sieve % passing 13.2 mm sieve % passing 9.5 mm sieve % passing 6.7 mm sieve % passing 4.75 mm sieve % passing 2.36 mm sieve % passing 0.425 mm sieve % passing 0.075 mm sieve	— — — 100 95-100 — — 50-70 — 35-55 — —	— 100 — — 50-85 — — 30-55 — 25-50 — —	— 100 — — 50-75 — — 15-35 — 5-15 — —	— — — 100 96-100 — 65-89 — 47-80 32-67 14-42 6-26	— 100 95-100 80-97 — — 48-85 — 35-73 25-58 10-33 3-21
AS 1289.3.6.3	Fine Particle Size Distribution Ratios expressed as percentages (for that portion of the material passing 2.36 mm sieve)					
	A. Pass 425 μ m sieve %	35-55	30-60	25-50	—	—
	B. Pass 75 μ m sieve % Pass 425 μ m sieve	35-55	35-60	25-50	—	—
	C. Pass 13.5 μ m sieve % Pass 75 μ m sieve	35-60	35-60	—	—	—
AS 1289.3.1.1	Liquid Limit (if non plastic)	max 23	max 23	—	max 23	max 23
AS 1289.3.3.1	Plastic Limit (if plastic)	max 20	max 20	—	max 23	max 23
AS 1290.3.3.1	Plasticity Index	max 12	max 12	max 12	max 12	max 12
T114	Maximum Dry Compressive Strength on fraction passing 19 mm sieve (only applies if Plasticity Index is less than 1)	min 1.0 MPa	min 1.0 MPa	—	1.0 MPa	1.0 MPa

Test method	Description	Subbase Material Requirements				
		DGS20	DGS40	GMS40	NGS20	NGS40
AS 1141.14	Particle Shape by Proportional Calliper - % misshapen (2:1)	max 35	max 35	max 35	—	—
AS 1141.22	Aggregate Wet Strength*	min 50 kN	min 50 kN	min 140 kN	—	—
AS 1141.22	Wet/Dry Strength Variation*					
	((Dry - Wet)/Dry) % Dry	max 60	max 60	max 30	—	—
AS 1289.6.1.1	4 day Soaked CBR (98% Modified Compaction)	—	—	—	30	30

NOTES:

Material consisting of rounded riverstone shall have minimum of two fractured faces on at least 75% of the particles larger than 6.70 mm.

* All fractions of the sample specified by AS 1141.22 must be within specification. The fraction with the highest wet/dry strength variation is the value for determining conformance with the specification. The fractions 19.0 mm to 13.2 mm and 6.7 mm to 4.75 mm must be tested. The other fractions do not need to be tested unless there is a risk in the opinion of the Superintendent that such fraction may fail the specification. Any fraction at risk of failing must be tested.

3 EXECUTION

3.1 SUBGRADE PREPARATION

General

General: Undertake subgrade preparation in accordance with the *Earthwork* worksection.

3.2 TOLERANCES

Surface level

General: Provide a finished surface which is free draining and evenly graded between level points.

Edges abutting gutters: Within ± 5 mm of the level of the actual gutter edge.

Tolerances: The tolerances in the **Surface level tolerances table** apply to the finished level of each layer, unless overridden by the requirements (including tolerances) for the finished level and thickness of the wearing course.

Surface level tolerances table

Item	Level tolerance	
	Absolute	Relative
Subbase surface	± 10 mm	10 mm
Base surface	± 10 mm	10 mm

3.3 SUBBASE AND BASE COMPACTION

General

General: Compact each layer of fill to the required depth and density, as a systematic construction operation and to conform to the minimum relative compaction table.

Minimum relative compaction table

Item description	Minimum dry density ratio (modified compaction) to AS 1289.5.2.1
Subbase	95
Base	98

Unstable areas: Remove any unstable areas which develop during rolling or identified by proof rolling for the full depth of the layer and dispose of and replace with fresh material.

Replacement materials: Conform to this specification.

Placing and compaction: Conform to this specification.

Compaction requirements

General: Apply uniform and sufficient compactive effort over the whole area to be compacted. Use rollers appropriate to the materials and compaction requirements.

Moisture content

General: During spreading and compaction, maintain materials at the optimum moisture content (modified compaction) within the range of -2% to +1% from the optimum moisture content.

Spraying: Maintain moisture content. Use water spraying equipment capable of distributing water uniformly in controlled quantities over uniform lane widths.

Rectification

General: If a section of pavement material fails to meet the required density or moisture content after compaction remove the non-complying material, replace with fresh material, and recompact.

Level corrections

General: Rectify incorrect levels as follows:

- High areas: Grade off.
- Low areas: Remove layers to a minimum depth of 75 mm, replace with new material and recompact.

3.4 PLACING BASE AND SUBBASE**General**

Weak surfaces: Do not place material on a surface which has been so weakened by moisture that it will not support, without damage, the constructional plant required to perform the work.

Spreading: Spread material in uniform layers without segregation.

Moisture content: Maintain wet mixed materials at the required moisture content before and during spreading. Add water to dry mixed materials through fine sprays to the entire surface of the layer after spreading, to bring the material to the required moisture content.

Layer thickness: 150 mm maximum and 75 mm minimum (after compaction). Provide equal layers in multilayer courses.

Joints

General: Plan spreading and delivery to minimise the number of joints. Offset joints in successive layers by at least 300 mm.

Final trimming

General: Trim and grade the base course to produce a tight even surface without loose stones or a slurry of fines.

0272 ASPHALTIC CONCRETE

1 GENERAL**1.1 RESPONSIBILITIES****General**

General: Provide a finished surface which is as follows:

- Free draining and evenly graded between level points.
- Even and smooth riding.

Selections: Conform to the **Selections**.

Standards

Hot mix asphalt: Comply with the recommendations of AS 2150.

Tolerances

General: Conform to the **Surface level tolerances table** which applies to the finished level of each layer, unless overridden by the requirements (including tolerances) for the finished level and thickness of the surface course.

Surface level tolerances table

Item	Level tolerance	
	Absolute	Relative
Longitudinal direction	± 10 mm	5 mm
Transverse direction	± 10 mm	10 mm

Compacted layer thickness:

- Any one sample: + 10 mm, - 5 mm.
- The mean thickness of the core samples in a lot: + unspecified, - 0.

Edges abutting gutters: Within ± 5 mm of the level of the actual gutter edge.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- *General requirements.*
- *Site management.*
- *Earthwork.*
- *Stormwater – site.*
- *Pavement base and subbase.*
- *Pavement ancillaries.*

1.3 INTERPRETATION**Definitions**

General: For the purposes of this worksection the definitions given below apply.

- Absolute level tolerance: Maximum deviation from design levels.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Relative compaction: The ratio between the field bulk density and the bulk density of the job mix when compacted in the laboratory.

1.4 INSPECTION**Notice**

Inspection: Give notice so that inspection may be made of the following:

- Surface prepared for priming, sealing or asphalt surfacing.
- Commencement of asphalt surfacing.
- Completion of asphalt surfacing.

1.5 TESTS

General

Tests: Perform tests of the type and frequency necessary to control the materials and processes used in the construction of the works and in conformance with the **Tests table**.

Process control tests

Records: Show the results of process control tests on control charts or graphs displayed on site in a readily accessible location and updated daily.

Methods: Use wet preparation methods where applicable.

Sampling: Determine timing and location.

Compliance assessment tests

Timing: Obtain materials samples at the time of delivery to the site.

Location: Sample from selected sample sites within designated uniform test lots, consisting of an area placed, or compacted or both in one day. Test lots must be uniform in terms of material properties and density.

Mix properties

General: Take samples from trucks at the mixing plant and test for mix properties using one of the following methods as applicable:

- Marshall stability of compacted mix:
 - . Compactive effort:
 - * 35 blows for light traffic,
 - * 50 blows for general conditions
 - * 75 blows for heavy traffic or deep lifts.

Variations in mix properties

General: Ensure that the maximum variation between the mix property of each sample and the job mix value conforms to the **Mix property table**.

Mix property table

Mix property	Maximum variation from job mix value
Aggregate passing 4.75 mm sieve or larger	± 4% by mass
Aggregate passing 2.36 mm to 300µm sieves	± 3% by mass
Aggregate passing 150µm sieve	± 2% by mass
Aggregate passing 75µm sieve	± 1% by mass
Bitumen content	± 0.3% by mass
Added filler content	± 0.5% by mass
Mixing temperature	± 10oC

Compaction tests

Density tests: Perform a field bulk density test for each test site from either of the following:

- On a core sample taken from the asphalt surfacing layer.
- If the nominal layer thickness is ≥ 50 mm, measured in situ using a nuclear gauge.

Sample preparation: To AS 2891.2.1 and AS 2891.2.2, as applicable.

Characteristic value of relative compaction: Calculate the value of relative compaction using the formulae in the **Relative compaction table**, in which X and S are the mean and the standard deviation, respectively of the individual relative compaction test values for the lot.

Relative compaction table

Number of tests per lot	Characteristic value
6	$X - 0.92S$
10	$X - 0.88S$

Acceptance criteria: The relative compaction of each lot of pavement must meet the criteria of the **Asphalt compaction acceptance criteria table**.

Asphalt compaction acceptance criteria table

	Test criteria scale	
	A	B
Number of test sites per lot: - Core sample tests	6	3
- Nuclear gauge tests	10	5
Lot value for relative compaction	Characteristic value	Mean value
Minimum value: - Layer thickness up to 50 mm	96%	94%
- Layer thickness 50 mm or more	96%	96%

1.6 SUBMISSIONS

Products – documentation

Certificate of compliance: As an alternative to testing a product, submit the manufacturer's certificate together with the results of recent tests undertaken by the manufacturer, showing conformance with test criteria.

Products – proposals

General: Submit the following details before commencing production:

- Combined aggregate particle size distribution.
- Binder content expressed as a percentage of the total mix.
- The filler content expressed as a percentage by mass of the combined aggregates.
- The asphalt mix properties.
- The proposed mixing temperature.

Products – samples

Samples: Submit samples of the following at least one month before use:

- Granular materials: One 50 kg sample of each proposed type and size of asphalt aggregate and cover aggregate.

Identification: Attach a tag to each sample showing relevant information including description, source and nominal size of material.

Execution – proposals

General: Submit proposals for the methods and equipment to be used, including the following:

- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.
- Methods and equipment for each operation.
- Sources of materials.
- Material stockpiles.

2 PRODUCTS

2.1 MATERIALS

Asphalt

Standards:

- Hot mix asphalt: To AS 2150.
- Medium cut back bitumen: To AS 2157, containing no fluxing oil.
- Tack coat mix: 3:2 bitumen emulsion:water.

- Bitumen emulsion: To AS 1160.
- . Designation: ARS/170-60.

Aggregate

Description: Clean, sound, hard, angular, of uniform quality, free from deleterious matter in conformance with the **Aggregate properties table**.

Standard: To AS 2758.5.

Crushed slag: Air-cooled blast furnace slag of uniform quality, generally free from vesicular, glassy or other brittle pieces.

Fine aggregate: Clean, sound, hard, durable particles of natural sand or particles derived from crushed stone, gravel or slag, free from injurious coating or particles of clay, silt, loam or other deleterious matter.

Aggregate properties table

Property	Test method	Value
Particle shape	AS 1141.14	≤ 25 for wearing course ≤ 30 for binder course and corrective course
Wet strength	AS 1141.22	≥ 50 kN
Wet/dry strength variation	-	≤ 35%

Binder

General: Bitumen binder, class 170.

Asphalt mix

General: Design the asphalt mix using the Marshall method as follows:

- Marshall stability: > 4.5 kN.
- Marshall flow: < 4.5 mm.
- Voids in total mix (maximum theoretical density based on apparent specific gravity of aggregates):
 - . Wearing courses: 3% – 5%.
 - . Binder courses and 7 mm mixes: 4% – 6%.
- Voids in aggregate filled with bitumen:
 - . Wearing courses: 75% – 85%.
 - . Binder courses and 7 mm mixes: 70% – 80%.

3 EXECUTION**3.1 PREPARATION****Cleaning**

General: Immediately before priming or tack coating remove loose stones, dust and foreign material from the base surface using a power broom or blower. Keep traffic off the cleaned surface.

Priming

General: Prime the base surface as soon as possible after compaction and finishing.

Potholes

General: Trim to a regular shape and a uniform depth of at least 75 mm, tack coat the edges and patch with asphaltic concrete.

Level anomalies

General: Flush kerbing, gutter or other concrete or metal components may require level modification to achieve safe foot surfaces or drainage. Prepare adjacent asphaltic areas as for potholes to achieve uniform or tapered depth to match final levels.

3.2 SURFACING**Protection**

General: Protect adjacent surfaces during spraying. Protect freshly sprayed surfaces from contamination.

Tack coating

General: Apply tack coat 30 – 120 minutes before asphalt surfacing is placed. Cover the surface uniformly at an application rate of 0.10 – 0.30 L/m² of residual bitumen.

Spreading

General: Place asphalt surfacing in dry weather on a dry pavement surface at a pavement temperature of at least 10C.

Operations: Spread the mix in layers covering the full width of the pavement, or, in the case of carriageways and wide pavements, in lanes of minimum width 3 m. Place layers in adjoining lanes to the same compacted thickness.

Abutting structures

General: Place asphalt surfacing to match the level of abutting surfaces such as kerbs, gutters, edge strips, manholes, or adjoining pavement in the same manner as for longitudinal and transverse joints. Fill spaces left unfilled between the spreader run and abutting edges with sufficient material to the proper height before compaction. Assess on site, level anomalies to determine the need to raise the surface level of a structure where the use of infill or tapered asphalt would create a local nuisance for pedestrians or lack of durability.

Matched junctions

General: If asphalt surfacing is to match an existing pavement, bridge deck, rail or other fixture, place the material to provide a smooth riding surface across the junction. Where necessary, remove sufficient of the existing pavement for this purpose. Where it is necessary to taper the thickness of a layer to provide a smooth riding junction, terminate the layer at a chase cut into the existing pavement about 20 mm deep and 400 mm wide. Where necessary, remove coarse particles from a layer of tapering thickness using hand raking.

Tack coat: Where the thickness of the layer tapers to less than twice the nominal size of the mix, tack coat the area upon which material of such thickness is to be placed uniformly at an application rate 0.50 – 0.75 L/m².

Compaction

General: Before commencing compaction, correct any irregularities in line or level. Trim lane edges to a straight line. Compact asphalt surfacing uniformly as soon as it will support rollers without undue displacement, and complete rolling while the mix temperature is above 80C.

3.3 JOINTS**Joints**

General: Minimise the number of joints. Make joints that are well bonded and sealed and provide a smooth riding surface across the joint.

Transverse joints: Construct a transverse joint if the operation is stopped for more than 20 minutes or the pavement temperature falls below 90C. Construct to a straight vertical face for the full depth of the layer, and offset in adjoining spreader runs and layer to layer by at least 2 m.

Longitudinal joints: Offset joints from layer to layer by at least 150 mm. Position longitudinal joints in the wearing course to coincide with the lane line.

Edges: Form exposed edges of each spreader run while hot to a straight line with a dense face inclined between vertical and 45.

Cold joints: Tack coat the surface of cold longitudinal and transverse joint before placing the adjoining asphalt.

3.4 COMPLETION**Defective compaction**

Minimum criteria for retention:

Characteristic value of relative compaction of the lot: $\geq 90\%$.

Mean of the individual relative compaction test values of the lot: $\geq 90\%$.

Defective layer thickness

Minimum criterion for retention:

Mean thickness of the core sample in the lot: ≤ 10 mm below the required layer thickness.

Rejection

Extent: Remove areas of rejected asphalt surfacing, including defective joints and finish, to the full depth of the layer, and replace with complying pavement.

Joints: Treat edges of remedial work as specified for cold joints.

Reinstating adjacent surfaces

General: Reinststate surfaces next to new pavements and associated elements. Where an existing flexible road pavement has been disturbed, trim it back to a straight and undisturbed edge 250 – 300 mm from and parallel to the new concrete for the full depth of the slab. Backfill with asphalt rammed solid, using suitable rammers.

Traffic on pavement

General: Give notice before opening the pavement to traffic before the work is completed. Provide protection.

Junctions with existing pavements

Trimming: Where the pavement is to be joined to an existing pavement remove a strip of the existing pavement at least 300 mm wide for its full depth and trim the edge to an angle of approximately 45 in steps of maximum height 150 mm before placing new pavement material.

Existing sealed pavement: Trim the seal to a neat edge.

0274 CONCRETE PAVEMENT

1 GENERAL

1.1 RESPONSIBILITIES

General

General: Provide finished surfaces that are:

- Free draining and evenly graded between level points.
- Even and smooth riding.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General requirements.*
- *Site management.*
- *Stormwater – site.*
- *Earthwork.*
- *Pavement base and subbase.*
- *Pavement ancillaries.*
- *Concrete finishes.*

1.3 STANDARDS

Concrete

Specification and supply: To AS 1379.

Materials and construction: To AS 3600.

1.4 INTERPRETATION

Definitions

General: For the purposes of this worksection the definitions given in AS 1348 and the following apply.

- Absolute level tolerance: Maximum deviation from design levels.
- Ambient temperature: The air temperature at the time of mixing and placing of concrete, and the predicted or likely air temperature at any time during the 48 hours following a concrete pour.
- Concrete class:
 - . Normal: Concrete which is specified primarily by a standard compressive strength grade and otherwise in accordance with AS 1379 clause 1.5.3.
 - . Special: Concrete which is specified to have certain properties or characteristics different from, or additional to, those of normal-class concrete and otherwise in accordance with AS 1379 clause 1.5.4.
- Early age: A mean compressive strength at 7 days exceeding the values shown in AS 1379 Table 1.2.
- Green concrete: Concrete which has set but not appreciably hardened.
- Joint:
 - . Construction: A joint provided to suit construction sequence with reinforcement continuous across the joint.
 - . Contraction: An unreinforced joint with a bond-breaking coating separating the concrete joint surfaces.
 - . Expansion: An unreinforced joint with the joint surfaces separated by a compressible filler.

- Weakened plane: A contraction joint created by forming a groove, extending at least one quarter the depth of the section, either by using a grooving tool, by sawing, or by inserting a premoulded strip.
- Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.
- Weather:
 - Cold: Ambient shade temperature < 10°C.
 - Hot: Ambient shade temperature > 32°C.

1.5 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Base or subgrade before covering.
- Membrane or film underlay installed on the base or subgrade.
- Concrete formwork, reinforcement and dowels in position.
- Commencement of concrete placing.
- Completion of concrete placing.
- Evaluation of surface finish.

1.6 TOLERANCES

General

Edges abutting gutters: Within ± 5 mm of the level of the actual gutter edge.

Rigid pavement surface:

- Absolute tolerance: ± 10 mm.
- Relative tolerance: 5 mm.

Concrete surface course: + unspecified, - 5 mm.

Joint locations (rigid pavement): 15 mm.

Flatness

Unformed surfaces: Confirm conformance with the **Flatness tolerance classes table** for the class of finish nominated using a straight edge placed anywhere on the surface in any direction.

Flatness tolerance class table

Class	Measurement	Maximum deviation (mm)
A	3 m straight edge	3
B	3 m straight edge	6
C	600 mm straight edge	6

1.7 SHRINKAGE SENSITIVE PAVEMENTS

Concrete performance

Drying shrinkage (maximum including tolerances): 650 μm for concrete up to and including strength grade 32; 700 μm for higher strength grades.

- Duration of air drying: 56 days.

1.8 TESTS

General

Sampling, identification and testing of specimens: Sample the concrete on site, at the point of discharge from the agitator to AS 1012.

Type and frequency:

Generally: Conform to AS 1379. For each property test at least two specimens from each sample.

Records and reports: To AS 1012.

Test certificates and records: Submit test certificates, and also retain results on site.

Concrete testing methods

Slump: Test at least one sample from each batch before placing concrete from that batch in the work.

- Standard: To AS 1012.3.1.
- Maximum slump variation: 15 mm.

Strength grade/Characteristic compressive strength: Spread the site sampling evenly throughout the pour.

- Sampling frequency: To the Project assessment strength grade sampling table.

Project assessment strength grade sampling table

Number of batches for each type and grade of concrete per day	Minimum number of samples
1	1
2-5	2
6-10	3
11-20	4
each additional 10	1 additional

Control tests

General: Determine strength using site cured specimens.

Conformance: Test in conformance with the **Control tests schedule**.

Flexural strength assessment of concrete

Standard: To AS 1012.8.2 and AS 1012.11.

Acceptance criterion: The average strength of any set of 3 consecutive project samples must be equal to or greater than the specified minimum value.

Embedded pressure pipes

General: If leak tests have not been successfully completed, do not embed pipes.

Test authority

General: Concrete supplier or NATA registered laboratory.-

1.9 SUBMISSIONS**Products – documentation**

General: As an alternative to testing a product, submit the manufacturer's certificate together with the results of recent tests undertaken by the manufacturer, showing compliance with test criteria.

Products – proposals

Curing compounds: If it is proposed to use a liquid membrane-forming curing compound submit certified test results for water retention to AS 3799 Appendix B.

Reinforcement: Submit the manufacturer's certificate of compliance with AS/NZS 4671, or submit test certificates from an independent testing authority.

Curing by the covering sheet method: Submit details of the proposed covering material.

Repair materials: Submit proposals for epoxy resin/grout and elastomeric sealant.

Execution – proposals

General: Submit proposals for the methods and equipment to be used for the pavement works, including the following:

- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.
- Methods and equipment for each operation.
- Sources of materials.
- Material stockpiles.
- Methods of concrete manufacture.
- Temperature control, curing and protection methods for concrete.

Trial mix design report: Six weeks before commencing production, submit a report for each mix design containing the information required in AS 1012.2, the individual and combined aggregate particle size distribution, and the records and reports for the tests.

Mix design variation: If a variation is proposed, submit a further mix design report.

Concrete: Submit proposals for mixing, placing, finishing and curing concrete including the following:

- Addition of water at the site.
- Changes to the plastic concrete mix.
- Curing and protection methods.
- Cutting or displacing reinforcement, or cutting hardened concrete.
- Handling, placing, compaction and finishing methods and equipment, including pumping.
- Sequence and times for concrete pours, and construction joint locations and relocations.

Cores, fixings and embedded items: If the locations of these items are not shown or are shown diagrammatically, submit shop drawings showing the proposed locations, clearances and cover, and indicating proposed repositioning of reinforcement.

Cutting or coring: If cutting or coring of hardened concrete is proposed, provide details.

Sawn joints: Submit proposed methods, timing and sequence of sawing joints.

Damaged galvanizing: If repair is required, submit proposals to AS/NZS 4680 Section 8.

Splicing: If splicing not documented is proposed, submit details.

Welding: If welding of reinforcement is proposed, provide details.

- Give notice before welding reinforcement.

Formed weakened plane joints: Before concrete placing submit details of the proposed systems and equipment.

Joint sealants: Submit proposals for installation methods and sealant performance.

Concrete placing: Submit proposals for size of the area to be placed and the spacing of planned construction joints before placement commences.

Crack assessment: If unplanned cracks occur in the finished pavement, submit proposals for investigation.

Surface repair method: If required, submit details of the proposed method before commencing repairs.

Pre-mixed supply

Delivery docket: For each batch, submit a docket listing the information required by AS 1379, and the following information:

- For special class performance concrete, specified performance and type of cement binder.
- For special class prescription concrete, details of mix, additives, and type of cement binder.
- Method of placement and climate conditions during pour.
- Name of concrete delivery supervisor.
- Project assessment carried out each day.
- The amount of water, if any, added at the site.
- The concrete element or part of the works for which the concrete was ordered, and where it was placed.
- The total amount of water added at the plant and the maximum amount permitted to be added at the site.-

Subcontractors: Submit names and contact details of proposed pre-mixed concrete suppliers, and alternative source of supply in the event of breakdown of pre-mixed or site mixed supply.

Execution – prototypes

General: Demonstrate by placing a test section that the proposed method of placement will produce a pavement complying with requirements. Remove test sections which do not comply with requirements and dispose of as directed.

2 PRODUCTS

2.1 PRODUCTS

Polymeric film underlay

Vapour barriers and damp-proofing membranes: To AS 2870 clause 5.3.3.

Reinforcement

Fibre reinforcement: Reference CIA CPN35.

Steel reinforcement: To AS/NZS 4671.

- Ductility grade: N.

Identification: Supply reinforcement which is readily identifiable as to grade and origin.

Surface condition: Free of loose mill scale, rust, oil, grease, mud or other material which would reduce the bond between the reinforcement and concrete.

Protective coating: For pavements containing protective coated reinforcement, provide the same coating type to all reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates and ferrules.

Epoxy coating: To be high build, high solids chemically resistant coating.

- Thickness: 200 µm minimum.

Galvanizing: To AS/NZS 4680:

- Sequence: If fabrication is to occur after galvanizing, submit proposals for galvanizing repair and coating of cut ends.
- Zinc-coating (minimum): 600 g/m².

Tie wire: To be annealed steel 1.25 mm diameter (minimum).

- Protection: Galvanized.

Dowels

General: Provide each dowel in one piece, straight, cut accurately to length with ends square and free from burrs.

Standard: To AS/NZS 4671.

- Ductility grade: N.

End tolerances: Ensure that deformation of an end from its true circular shape does not exceed 1 mm nor extend more than 1 mm from the end.

Concrete mix

Design: Design the mix to suit the methods of concrete manufacture, placing, compaction and finishing.

Aggregate

Standard: To AS 2758.1.

Aggregate size:

- For fixed form placement: < 40 mm.
- For slip form placement: Compatible with the paving machine.

Washing: Wash aggregate as necessary or as directed to achieve requirements for soluble salt content or removal of other impurities.

Concrete exposure classification (for durability assessment): Severe.

Cement

Standard: -To AS 3972.

- Type: GP or GB.

Premixed concrete

Supply: Use the prescription ordering method.

Curing products

Curing compounds: To AS 3799, Type 2, white pigmented or containing aluminium reflective pigments.

Covering sheet materials: To be white opaque or clear polyethylene film, or white burlap-polyethylene sheet, or equivalent material.

Standard: To ASTM C171.

Preformed elastomeric seals

Requirement: Provide seals with vertical sidewalls, marked durably on the top surface every 300 mm \pm 2 mm at the time of manufacture and in conformance with the Preformed elastomeric seal properties table.

Standard: To ASTM D2628.

Depth: To retain the seal in the joint, but not greater than 50 mm when the seal is compressed laterally to 50% deformation.

Lubricant adhesive: A compound of the same base polymer as the seal, blended with suitable volatile solvents of viscosity suitable to the installation equipment, with the following properties:

- Average net mass per litre: 0.784 kg \pm 5%.
- Film tensile strength: 15 MPa minimum.
- Elongation before breaking: 750% minimum.

Preformed elastomeric seal properties table

Nominal width of seal	Deformation range (% of nominal width) before and after heat aging	Required force (N/m) range	
		Before heat aging	After heat aging
< 10 mm	20 – 50	350 – 2100	175 – 2100
> 12 mm	20 – 50	350 – 2100	260 – 2100

Self-expanding cork seals

General: Preformed self-expanding cork in factory bonded lengths, with taped top surface.

Length: Equal to the paving lane width for transverse joints, or 4 m for longitudinal joints.

Properties:

- Accelerated weathering: No evidence of disintegration.
- Resistance to test fuel (48 hours immersion in test fuel): No evidence of the following:
 - . Dislodgment of cork particles by test treatment.
 - . Dislodgment of cork particles when the faces of the material are rubbed with fingers.
 - . Loss of resilience i.e. may be broken into pieces more easily.
- Dimension tolerance (unexpanded state):
 - . Width: \pm 1.5 mm.
 - . Depth: \pm 3.0 mm.

Cork seal properties table

Property	Requirement	
	Minimum	Maximum
Density (kg/m ³)	335	-
Lateral restraining pressure in water at 27°C \pm 1°C (kPa):	-	60
-After 6 hours' immersion	-	180
-After 24 hours' immersion	-	180
Lateral free swell in water at 27°C \pm 1°C (% of initial width):	25	-
-After 24 hours' immersion	30	-
-After 168 hours' immersion	-	2
Longitudinal free swell in water at 27°C \pm 1°C after 168 hours' immersion (% of initial length)	-	2
Longitudinal shrinkage on drying for 12 days at 40°C – 50°C after 168 hours' immersion in water (% of initial length)	-	2
Lateral expansion in boiling water after 1 hour's immersion (expanded width as % of initial width)	140	-
Compression and recovery:	350	10,500
-Pressure required to compress to 50% of uncompressed width (kPa)		

-Recovery after 1 hour following compression to 50% of uncompressed width (recovered width as % of uncompressed width)	90	-
Extrusion of free edge following compression to 50% of uncompressed width with three edges restrained (mm)	-	6

Inert form strip

General: Polystyrene, foam or cork strip for use with preformed elastomeric seals that are inserted after forming and subsequent removal of the upper section of the inert form strip.

Sealants

General: Do not use pourable sealants.

Surface hardeners, sealants and protectors

Material: Proprietary products for installation in accordance with the manufacturer's written requirements.

3 EXECUTION**3.1 PREPARATION****Junctions with existing pavements**

Trimming: Where the pavement is to be joined to an existing pavement remove a strip of the existing pavement at least 300 mm wide for its full depth and trim the edge vertically before placing new pavement material.

Existing sealed pavement: Trim the seal to a neat edge.

Fixed formwork

Description:

- Steel forms.
- Seasoned, dressed timber planks, free of warps, bends or kinks, with the full width of their top edges covered with steel angle sections finishing flush with the form face.

Depth: Equal to the edge thickness of the slab and in one piece.

Tolerances on position:

- Absolute level tolerance: ± 5 mm (maximum departure of top surface from the required level).
- Relative level tolerance: 5 mm (maximum departure of top surface from a 3 m straightedge).
- Horizontal tolerance: ± 10 mm (maximum departure of face from a plane surface).
- Verticality: 3 mm departure from vertical.

Staking: Stake forms in position using at least 3 steel stakes per form, not more than 1.5 m apart. Lock joints between form sections to prevent movement.

Release agent: Before placing reinforcement, apply a release agent compatible with the contact surfaces, to the interior of the formwork, except where the concrete is to receive an applied finish for which there is no compatible release agent. Clean the reinforcement to remove all traces of release agent.

Re-use: Clean and recoat the forms each time before placing concrete.

Keyways: Form the keyways of keyed construction joints using steel form strips accurately located at the mid-depth of the slab and securely fastened flush against the formwork face.

Reinforcement

Tolerances in fabrication and fixing: To AS 3600.

Supports: Provide proprietary concrete, metal or plastic supports to reinforcement in the form of chairs, spacers, stools, hangers and ties, as follows:

- To withstand construction and traffic loads.
- With a protective coating if they are ferrous metal extending to the surface of the concrete, or are used with galvanized or zinc-coated reinforcement.
- Minimum spacing:
 - . Bars: 60 diameters.

- . Fabric: 800 mm.
- Supports over membranes: Prevent damage to waterproofing membranes or vapour barriers. If appropriate, place a metal or plastic plate under each support.
- Projecting reinforcement: If 'starter' or other bars project beyond reinforcement mats or cages, through formwork or from cast concrete, provide a plastic protective cap to each bar until it is incorporated into subsequent work.
- Tying: Secure the reinforcement against displacement by tying at intersections with either wire ties, or clips. Bend the ends of wire ties away from nearby faces of forms so that the ties do not project into the concrete cover.
- Mats: For bar reinforcement in the form of a mat, secure each bar at alternate intersections.

Dowels and tie bars

Location: Across joints at the required spacings and vertical locations correctly aligned parallel to the finished pavement surface and perpendicular to the joint in plan. If the construction methods require alterations to the designed spacing, space closer with additional dowels or tie bars.

Placing in fixed-form paving: Use the bonded-in-place method. Embed the unpainted half of the dowels in the slab placed first.

Placing in longitudinal joints in slip-form paving: Place using machine or vibrate into the plastic concrete using a suitable template.

Movement: Do not distort or displace beyond the alignment tolerances under testing or during construction. Do not remove and replace dowels in pre-formed holes.

Horizontal and vertical location: \pm half the diameter of the dowel.

Alignment: Locate bars in the joint within 2 mm in 300 mm and adjacent bars which do not differ in alignment by more than 2 mm in 300 mm.

Cores, fixings and embedded items

Position: Fix cores and embedded items to prevent movement during concrete placing. In locating cores, fixings and embedded items, reposition but do not cut reinforcement, and maintain cover to reinforcement.

Isolation: Isolate embedded items so that water cannot track to concrete providing minimum cover to reinforcement.

3.2 POLYMERIC FILM UNDERLAY

Location

General: Under slabs including integral ground beams and footings, provide a vapour barrier or, in areas prone to rising damp or salt attack, a damp-proofing membrane.

Installation

General: Lay over the base, lap joints at least 200 mm and seal the laps and penetrations with waterproof adhesive tape. Face the laps away from the direction of concrete pour. Take the underlay up vertical faces past the damp proof course where applicable, and tape fix at the top. Patch or seal punctures or tears before pouring concrete. Cut back as required after concrete has gained strength and forms have been removed.

Base preparation

General: According to base type, as follows:

- Graded prepared subgrade: Blind with sufficient sand to create a smooth surface free from hard projections. Wet the sand just before laying the underlay.

3.3 CEMENT

Bagged cement

Standard: To AS 3972.

- Age: Less than 6 months old.
- Storage: Store cement bags under cover and above ground.

Chemical admixtures

Contents: Free of chlorides, fluorides and nitrates.

3.4 CONCRETE

Elapsed delivery time

General: Ensure that the e-lapsed time between the wetting of the mix and the discharge of the mix at the site is in conformance with the **Elapsed delivery time table**. Do not discharge at ambient temperature below 10°C or above 30°C.

Elapsed delivery time table

Concrete temperature at time of discharge (C)	Maximum elapsed time (hours)
10 – 24	2.00
24 – 27	1.50
27 – 30	1.00
30 – 32	0.75

Pre-mixed supply

Addition of water: If water is to be added, comply with AS 1379 Section 4.2.3.

Transport: Mode must prevent segregation, loss of material and contamination of the environment, and must not adversely affect placing or compaction.

Site mixed supply

Emergencies: If mixing by hand is carried out, provide details.

Plant: Mix concrete in a plant located on the construction site.

3.5 CONCRETE PLACING AND COMPACTION

Placing in fixed forms

General: Place concrete uniformly over the width of the slab or lane and so that the face is generally vertical and normal to the direction of placing. Hand spread concrete using shovels, not rakes.

Vibration: Compact concrete using internal mechanical vibration of sufficient amplitude to produce noticeable vibrations at 300 mm radius. Insert vibrators into the concrete at spannings and to the depth which will provide the best compaction, but not deeper than 50 mm above the surface of the subbase, and for a duration sufficient to produce satisfactory compaction, but not longer than 30 seconds in any one location.

Slip form placing

Spreading: Place the plastic concrete in a uniform layer over the width of the slab being placed. Do not damage the existing surface and edge of previously constructed concrete.

Vibration: Use suitable internal vibrators or surface type equipment with vibrating beam, or beams, to fully compact the whole depth of the concrete.

Slab edges: Use supplementary immersion type vibrators next to slab edges if necessary to ensure that the sides of slabs present a uniform dense appearance free from honeycombing or areas deficient in fines over at least 95% of the surface.

Rate

General: Place at a rate of at least 25 linear metres of pavement per hour.

Placing records

General: Keep on site and make available for inspection a log book recording each placement of concrete, including the following:

- Date.
- Specified grade and source of concrete.
- Slump measurements.
- The portion of work.
- Volume placed.

Finishing

General: Immediately after placement and spreading and compaction of the plastic concrete, start finishing operations to achieve the documented finish.

Rain

General: During placement and prior to setting, do not expose concrete to rain.

Protection: Protect surface from damage by covering until hardened.

3.6 CONCRETE PLACING IN COLD WEATHER

Cement

General: Do not use high alumina cement.

Placing

Concrete: Maintain the temperature of the freshly mixed concrete at 5°C.

Formwork and reinforcement: Before and during placing maintain temperature at 5°C.

Severe weather

General: If severe weather conditions are predicted, use high early strength cement.

Temperature control

General: Heat the concrete materials, other than cement, to the minimum temperature necessary to ensure that the temperature of the placed concrete is within the limits specified.

Admixtures: Do not use calcium chloride, salts, chemicals or other material in the mix to lower the freezing point of the concrete.

Frozen materials: Do not allow frozen materials or materials containing ice to enter the mixer, and keep free of frost and ice any forms, materials, and equipment coming in contact with the concrete.

Maximum temperature of water: 60°C when it is placed in the mixer.

Plastic concrete: Prevent plastic concrete from freezing, without using salts or chemicals.

3.7 CONCRETE PLACING IN HOT WEATHER

Handling

General: Prevent premature stiffening of the fresh mix and reduce water absorption and evaporation losses. Mix, transport, place and compact the concrete in conformance with the **Elapsed delivery time table**.

Placing

Concrete: Maintain the temperature of the freshly mixed concrete in conformance with the **Hot weather placing table**.

Formwork and reinforcement: Before and during placing maintain temperature at 35°C.

Severe weather

General: If ambient shade temperature > 38°C, do not mix concrete.

Temperature control

General: Select one or more of the following methods of maintaining the specified temperature of the placed concrete:

- Cool the concrete using liquid nitrogen injection before placing.
- Cover the container in which the concrete is transported to the forms.
- Spray the coarse aggregate using cold water prior to mixing.
- Use chilled mixing water.

Hot weather placing table

Concrete element	Temperature limit
Normal concrete in footings, beams, columns, walls and slabs	35°C
Concrete in sections ≥ 1 m in all dimensions except for concrete of strength 40 MPa or greater, in sections exceeding 600 mm in thickness	27°C

Evaporation control

Barriers: Erect barriers to protect freshly placed concrete from drying winds.

3.8 CONCRETE CURING

General

Curing: Cure continuously from completion of finishing until the total cumulative number of days or fractions of days, during which the air temperature in contact with the concrete is above 10°C, is at least 7 days.

Self levelling toppings: If used also for curing, confirm compliance with AS 3799.

End of curing period: Prevent rapid drying out at the end of the curing period.

Protection: Maintain at a reasonably constant temperature with minimum moisture loss, during the curing period.

Cold weather curing

General: Maintain concrete temperature between 10 – 20°C for curing period.

Hot weather curing

Curing compounds: If it is proposed to use curing compounds, provide details.

Protection: Select a protection method as applicable.

- If the concrete temperature exceeds 25°C or if not protected against drying winds, protect the concrete using a fog spray application of aliphatic alcohol evaporation retardant.
- If ambient shade temperature is > 35°C, protect from wind and sun using an evaporative retarder until curing is commenced.
- Immediately after finishing, either cover exposed surfaces using an impervious membrane or hessian kept wet until curing begins, or apply a curing compound.

Curing methods

General: If water is used, -pond or continuously sprinkle in such a way as to not cause damage to the concrete surface, for the required curing period.

Covering sheet method: Immediately after finishing operations cover concrete using damp hessian or cotton mats overlapped at least 150 mm and anchored against displacement by wind or other interference. Keep the mats continuously damp until covered by the covering sheet material. Repair tears immediately.

- Joint sawing: Sheet materials may be removed for the minimum distance and period to permit joint sawing, provided the concrete is kept moist by other means.

Moist curing method: Immediately after finishing operations and once concrete has set sufficiently to be not damaged by the curing process keep the concrete surface continuously damp by spraying constantly with water, fog, or mist, using suitable spraying equipment.

Curing compounds

Standard: To AS 3799.

Application: Provide a uniform continuous flexible coating without visible breaks or pinholes, which remains unbroken at least for the required curing period after application. Respray defective areas within 30 minutes. Respray within 3 hours after heavy rain.

3.9 JOINTS

Joints

General: Construct expansion, contraction and construction joints straight and plumb. Make transverse joints normal to longitudinal joints. Extend transverse expansion and contraction joints continuously from edge to edge of the pavement through interconnected slabs.

Transverse construction joints:

- Planned location: Terminate each day's placing operation at a transverse construction joint located to coincide with a planned contraction or expansion joint.
- Unplanned joints: If placement is interrupted for 30 minutes or longer, form a tied transverse construction joint within the middle third of the distance between planned joints but no closer than 1.5 m to the nearest planned joint. If necessary remove placed concrete back to the required location.

Expansion joints: Provide formed full depth joints around structures and features which project through, into or against the pavement, and elsewhere as required.

Formed joints

Full depth joints: Form the edge of the concrete placed first to provide a smooth, vertical face. After stripping and cleaning fix the joint filler with a suitable waterproof adhesive to the face of the slab, and place the adjoining concrete after the adhesive has set.

Weakened plane joints: Cut a crack-inducing groove by using a suitable tool into the plastic concrete during finishing of the concrete surface. Compact and refinish the plastic concrete around the groove after forming the joint.

Rebated groove joints: Form the rebate by securely fixing removable steel or timber form strips to the form or forms on the slab which is placed first, so that the top of the steel strip is flush with the top of the form. After stripping and cleaning, fix the joint filler in the rebate after placing the adjoining concrete.

Sawn joints

Weakened plane joints: Saw the hardened concrete to depth at least $\frac{1}{4}$ to $\frac{1}{3}$ of the pavement thickness and to a uniform width in the range of 3 – 5 mm as follows:

- Timing: Commence sawing, regardless of time or weather conditions, as soon as the concrete has hardened sufficiently to permit cutting with only minor ravelling of the edges of the sawcut. Complete sawing no later than 24 hours after concrete placement.
- Sequence: If possible, saw every third transverse joint initially, then saw the intermediate joints. Start where concrete placement has commenced.
- Cracking: If the concrete has already cracked near the location chosen for a joint, do not saw a joint in that location. If a crack develops ahead of the saw cut, discontinue sawing and submit proposals for extra sawn joints. If uncontrolled cracking occurs, suspend concrete placing.
- Stand-by machines: Provide one stand-by sawing machine for each machine planned to be used.
- Cleaning and protection: Immediately after each joint is sawn, flush the saw cut and adjacent concrete surface using water, until the waste from sawing is removed from the joint. Temporarily caulk the joint using plastic or rubber tubing, or a suitable 'Tee' shaped extrusion. Leave the caulking in place until grooving and sealing.

Rebated groove joints: Saw straight, parallel sided grooves for joint seals on top of and centred on the sawn weakened plane joints.

- Timing: Commence sawing after the curing period has ended, immediately before joint sealing. Saw during daylight hours.

Dowelled joints

General: Formed or sawn joints reinforced with dowels and sealed.

Tied joints

General: Formed or sawn joints reinforced with tie bars. Omit grooves and sealing unless shown on the drawings.

Stripping time

General: At least 12 hours.

Preparing joints

General: Immediately before installation of the sealer ensure that the joint space is dry, clean and free from loose material. Remove laitance, curing compound and protrusions of hardened concrete from the sides and upper edges of the joint.

Formed full depth and rebated groove joints: After form stripping and when the concrete has cured sufficiently, clean formed arrises.

Sawn joints: Remove loosened material from the joint using compressed air or high pressure water jet.

Installing preformed elastomeric seals

General: Apply a bead of lubricant adhesive to the top edge of each side of the joint, then install the seal by easing it into the joint, using a suitable roller, to finish 4 - 6 mm below the finished concrete surface.

3.10 FORMED SURFACES

General

Damage: Do not damage concrete works through premature removal of formwork.

Curing: If forms are stripped when concrete is at an age less than the minimum curing period, commence curing exposed faces as soon as the stripping is completed.

3.11 UNFORMED SURFACES

General

General: Strike off, screed and level slab surfaces to finished levels, to the tolerance class noted in the **Unformed surface finishes schedule**.

Surface finishes

General: Provide surface finishes in conformance with the **Unformed surface finishes schedule**.

Surface repairs

Surface repair method: If surface repairs are required, submit proposals.

Finishing methods – primary finish

Machine float finish:

- After levelling, consolidate the surface using a machine float.
- Cut and fill and refloat immediately to a uniform, smooth, granular texture.
- Hand float in locations inaccessible to the machine float.

Steel trowel finish: After machine floating finish as follows:

- Use power or hand steel trowels to produce a smooth surface relatively free from defects.
- When the surface has hardened sufficiently, re-trowel to produce the final consolidated finish free of trowel marks and uniform in texture and appearance.

Burnished finish: Continue steel trowelling until the concrete surface attains a polished or glossy appearance, uniform in texture, appearance and free of trowel marks and defects.

Wood float finish: After machine floating use wood or plastic hand floats to produce the final consolidated finish free of float marks and uniform in texture and appearance.

Broom finish: After machine floating and steel trowelling draw a broom or hessian belt across the surface to produce a coarse even-textured transverse-scored surface.

Scored or scratch finish: After screeding, give the surface a coarse scored texture using a stiff brush or rake drawn across the surface before final set.

Sponge finish: After machine floating and steel trowelling, obtain an even textured sand finish by wiping the surface using a damp sponge.

Finishing methods – supplementary finish

Abrasive blast: After steel trowelling, abrasive blast the cured surface to provide texture or to form patterns without exposing the coarse aggregate using hard, sharp graded abrasive particles.

- Type of particles: [complete/delete]

Coloured applied finish: To a machine float finished surface, apply a proprietary liquid or dry shake material in accordance with the manufacturer's written requirements and trowel to achieve the required appearance.

Product: Refer to tender drawings

Colour: Refer to tender drawings

3.12 COMPLETION**Protection**

General: Keep traffic, including construction plant, off the pavement entirely during curing, and thereafter permit access only to necessary construction plant vehicles that do not load the pavement to greater than its capacity.

Reinstating adjacent surfaces

General: Reinstall surfaces next to new pavements and associated elements. Where an existing flexible road pavement has been disturbed, trim it back to a straight and undisturbed edge 250 – 300 mm from and parallel to the new concrete for the full depth of the slab. Backfill with asphalt rammed solid, using suitable rammers.

Traffic on pavement

General: Give notice before opening the pavement to traffic before the work is completed. Provide protection.

0275 SEGMENTAL PAVERS – MORTAR BED

1 GENERAL

1.1 RESPONSIBILITIES

General

General: Provide external paving:

- Consistent in colour and finish.
- Firmly bonded to substrates for the expected life of the installation.
- Resistant to expected impacts in use.
- Set out with joints accurately aligned in both directions.
- To direct all water flowing from supply points to drainage outlets without leakage to the substrate or adjacent areas.

Selections: Conform to the **Selections**.

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- *General requirements.*
- *Stormwater - site.*
- *Pavement base and subbase.*

1.3 INTERPRETATIONS

Definitions

General: For the purposes of this worksection the definitions given below apply.

- Adhesives:
 - . Cementitious (C): Adhesives in which the binders are hydraulic, e.g. Portland cement, with aggregates and organic additives.
 - . Dispersion (D): Adhesives in which the binders are in the form of aqueous polymer dispersion with mineral fillers and organic additives.
 - . Reaction resin (R): Adhesives in which the binders are synthetic resins with mineral fillers and organic additives. The curing occurs by chemical reaction.
- Substrates: The surface to which a material or product is applied.
- Bedding: Mixtures of materials which are applied to substrates in a plastic state and dry and cure to adhere tiles to substrates.
 - . Adhesive bedding: Tiling adhered by adhesives.
 - . Mortar bedding: Tiling adhered in a cementitious mortar bed.
- Pavers: Slabs made from clays, stone, precast concrete and/or other inorganic raw materials generally over 20 mm thick used as coverings for floors and supported over continuous substrates.
 - . Terrazzo tiles – cementitious: Manufactured cementitious terrazzo tiles formed in a suitable machine to give sufficient compaction and density to the finished surface, and moisture cured before grinding and honed at the place of manufacture. Thickness usually 35 mm.
- Lippage: Height deviation between adjacent pavers.

1.4 INSPECTION

Notice

Inspection: Give notice so that inspection may be made of the following:

- Substrate immediately before paving.
- Trial set-outs before execution.

- Control joints before sealing and grouting.

1.5 STANDARDS

Slip resistance

Classification: To AS/NZS 4586 for the classifications as documented.

Slip resistance measurement of existing installations: To AS/NZS 4663.

Testing authority

General: Independent third party Registered testing authority.

1.6 SUBMISSIONS

Samples

General: Submit labelled samples of pavers, grout and sealants, illustrating the range of variation in colour and finish.

Sample panels

General: Prepare a sample panel of each type of finish as follows:

- Size: $\geq 2 \text{ m}^2$.
- Include samples of junction details and trim.
- Preserve each panel until related work is complete.

The sample panel shall be the benchmark of quality of execution for the project.

Execution

Grouting: Submit proposals for grouting methods and materials.

Margins: If it appears that minor variations in joint widths or overall dimensions will avoid cut pavers, submit a proposal.

1.7 TESTS

General

Type tests: Submit as follows:

- Slip resistance to AS 4586: [complete/delete]
- Stone paver properties: [complete/delete]
- Field tests of completed pavement: Slip resistance to AS/NZS 4663.

Program: Conduct field tests immediately prior to the date of practical completion.

Field test of completed pavement: Slip resistance to AS/NZS 4663.

Program: Conduct tests immediately prior to practical completion.

- Impact sound insulation: [complete/delete]

Flood tests: Submit a report of flood tests conducted on site as follows: [complete/delete]

Salt efflorescence: Provide prototype testing of cementitious tiles for salt efflorescence as follows: [complete/delete]

1.8 PRODUCT CONFORMITY

General

General: Submit current assessments of conformity as follows:

- Declaration of conformity by an AS ISO 9001 quality management system certified supplier:
 - . Slip resistance of tiles to AS/NZS 4586.
 - . Marking and Classification of tile adhesive to AS 4992.1.

1.9 TOLERANCES

Completed paving

General: Conform to the **Surface level tolerances table**:

Surface level tolerances table

Item	Level tolerance	
	Absolute	Relative
Vehicular pavements	$\pm 5 \text{ mm}$	5 mm

Item	Level tolerance	
	Absolute	Relative
Pedestrian pavements	± 10 mm	< 10 mm

Level discontinuity: Between adjacent pavers and other surface features for footpath areas 1.5 mm and roadway areas 2.0 mm.

Lippage:

- Unpolished pavers: < 2 mm.
- Polished pavers 300 x 300 mm or less: < 1 mm, with 5% not exceeding 1.5%.
- Polished pavers over 300 x 300 mm: < 1.5 mm, with 5% not exceeding 2%.

2 PRODUCTS

2.1 ADHESIVES

General

Standard: To AS 2358 or AS 4992.1.

Type

General: Provide adhesives compatible with the materials and surfaces to be adhered.

Prohibited uses: Do not provide the following combinations:

- Organic PVC-based adhesives and organic natural rubber latex adhesives in damp or wet conditions.
- PVA (polyvinyl acetate) based adhesives in wet areas or externally.

2.2 MORTAR

Materials

Cement: To AS 3972.

- Type: GP or GB.
- White cement: Iron salts content 1%.
- Off-white cement: Iron salts content 2.5%.

Lime: To AS 1672.1.

Sand: Fine aggregate with a low clay content selected for grading, sharp and free from efflorescing salts.

Water: To the recommendations of AS 3958.1.

Measurement of volume: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

Bedding mortar

Proportioning: Select proportions from the range 1 cement:3 sand – 1 cement:4 sand to obtain satisfactory adhesion. Provide minimum water.

Mixing: To AS 3958.1.

Gauging: Site gauged by volume.

2.3 GROUT

Type

Cement based proprietary grout: Mix with water. Fine sand may be added as a filler in wider joints.

Portland cement based grout: Mix with fine sand. Provide minimum water to achieve workability.

- For joints < 3 mm: 1 cement:2 sand.
- For joints ≥ 3 mm: 1 cement:3 sand.

Pigments

Pigments for coloured grout: Provide colourfast pigments compatible with the grout material. For cement-based grouts, provide inorganic mineral pigments or lime-proof synthetic metallic oxides compatible with cement.

Water

General: Clean and free from any deleterious matter.

Grout to resin terrazzo tiles: Resinous material supplied by the tile supplier.

2.4 PAVERS**Standard**

Masonry units, pavers and flags: To AS/NZS 4455.1.

Salt attack resistance grade to: AS/NZS 4455.1 Table 2.3: [complete/delete]

Sandstone flagging

Description: Provide sound stone flags of uniform quality. Reject flags with following defects liable to affect strength and durability. Vents, cracks, fissures, seams, porous inclusions, foreign material, loose surface material, and discolouration.

Matching: Select for optimum matching of colour and pattern.

Split flagging thickness: Minimum 50 mm, maximum 75 mm.

Face size: Utilise smaller sizes for pathways and larger sizes for open areas and maintain traditional stone flagging appearance.

Stone setts

Description: Igneous stone cubed cobble style setts.

3 EXECUTION

3.1 SUBSTRATES**Drying and shrinkage**

General: Before paving, allow at least the following times to elapse (for curing and initial shrinkage) for these substrates:

- Concrete slabs: 28 days.
- Toppings on slabs: A further 21 days.

3.2 PREPARATION**Trial set-out**

General: Prepare a trial paving set-out to each area as follows to:

- Maximise the size of equal margins of cut pavers.
- Locate movement joints.
- Note minor variations in joint widths to eliminate cut tiles at margins.

Ambient temperature

General: If the ambient temperature is < 5 or > 35°C, do not lay pavers.

Substrates

General: Ensure substrates are as follows:

- Clean and free of any deposit or finish which may impair adhesion or location of pavers.
- Excessive projections are hacked off and voids and hollows are filled with a cement:sand mix not stronger than the substrate nor weaker than the bedding.

Absorbent substrates: If suction is excessive, control it by dampening but avoid over-wetting and do not apply mortar bedding to substrates showing surface moisture.

Concrete: If not sufficiently rough to provide a mechanical key, roughen by scabbling or the like to remove 3 mm of the surface and expose the aggregate; then apply a bonding treatment.

Fixtures

General: Before paving ensure that fixtures interrupting the surface are accurately positioned in their designed or optimum locations relative to the paving layout.

3.3 PAVING GENERALLY

Variations

General: If necessary, distribute variations in hue, colour, or pattern uniformly, by mixing pavers or paving batches before laying.

Paving joints

Joint widths: Set out pavers to give uniform joint widths of 6 to 12 mm.

Margins

General: Provide whole or purpose-made pavers at margins where practicable, otherwise set out to give equal margins of cut pavers. If margins less than half paver width are unavoidable, locate the cut pavers where they are least conspicuous.

Protection

Traffic: Keep pedestrian and vehicular traffic off paving until the bedding has set and attained its working strength.

Cleaning: Keep the work clean as it proceeds and protect finished work from damage.

3.4 MORTAR BEDDING

Preparation of pavers

Suction: Soak porous pavers in water for half an hour and then drain until the surface water has disappeared.

Bedding

General: Use bedding methods and materials which are appropriate to the paver, the substrate, the conditions of service, and which leave the paver firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

Mortar beds

Substrate preparation: Either lightly dust the screeded bed surface with dry cement and trowel level until the cement is damp, or spread a thin slurry of neat cement, or cement-based thin bed adhesive, on to the tile back. Do not provide mortar after initial set has occurred.

Nominal thickness: [complete/delete]

Sandstone flagging

Sub grade: Compact to 95% of the maximum dry density when tested to AS 1289.

Mortar bed thickness: Minimum 50 mm to maximum 60 mm.

Laying pattern: Random, with smaller stones filling the gaps to produce roughly uniform joint widths.

Lay flags and fill joints in one operation.

Stone setts dry bed

Description: Lay and tamp setts on to a dry sand and cement mix, compact and moisten as follows:

- Bed: 1 cement to 3 sand, screeded to the level required to allow setts to be firmly tamped.
- Select the top side of the sett for surface uniformity and tap into the mix to the pre compaction position.
- Compact with a hand ram or mechanical compactor.
- Water spray the surface and allow the bedding to harden.
- Grout joints.

3.5 ADHESIVE BEDDING

Preparation of pavers

Adhesive bedding: Fix pavers dry.

Bedding

General: Use bedding methods and materials which are appropriate to the paver, the substrate, the conditions of service, and which leave the paver firmly and solidly bedded in the bedding material and adhered to the substrate. Form falls integral with the substrate.

Thick adhesive beds

General: Provide on substrates with deviations up to 6 mm when tested with a 2 m straight edge, and with tiles having deep keys or frogs.

Nominal thickness: 6 mm.

Adhesive bedding application

General: Apply adhesive by notched trowel to walls and floors and direct to pavers if required, to provide evenly distributed coverage of > 90% after laying.

Pattern of distribution of adhesive: Conform to AS 3958.1. Verify by examining one paver in ten as work proceeds.

Allow the adhesive to cure for the period nominated by the manufacturer prior to grouting or allowing traffic.

3.6 MOVEMENT JOINTS**General**

General: Provide movement joints as follows:

- Location:
 - . Over structural (isolation, contraction, expansion) joints.
 - . At internal corners.
 - . Close to external corners in large paved areas.
 - . Around the perimeter at abutments.
 - . At junctions between different substrates.
 - . To divide large paved areas into bays, maximum 5 m wide, maximum area 16 m².
 - . At abutments with the building structural frame and over supporting walls or beams where flexing of the substrate is anticipated.
- Depth of joint: Right through to the substrate.
- Sealant width: 6 – 25 mm.
- Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

Movement joint types

Divider strip: A proprietary expansion joint consisting of a neoprene filler sandwiched between plates with lugs or ribs for mechanical keying. Set flush with the finished surface.

Proprietary slide plate divider strip: An arrangement of interlocking metal plates grouted into pockets formed in the concrete joint edges.

Sealant: Two-pack self-levelling flexible mould resistant, one-part silicone or polyurethane sealant applied over a backing rod. Finish flush with the tile surface.

- Floors: Trafficable, shore hardness > 35.

Backing rod: Compressible closed cell polyethylene foam with a bond-breaking surface.

3.7 GROUTED AND CAULKED JOINTS

Delete

1101 CONTROL OF TRAFFIC

1 GENERAL

1.1 RESPONSIBILITIES

Objectives

Traffic control: Provide traffic control for works on roads. Construct the work with the least possible obstruction to traffic.

Performance

General: Provide the following:

- Personnel plant and equipment.
- Temporary roadways and detours.
- Arrangement for traffic.
- Traffic control devices.

Requirements: Ensure the safety of workers and safety and convenience of road users.

Design

Designer: The contractor is responsible for designing the TMP.

Authority requirements: The TMP is to be submitted to the Superintendent for approval

1.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- All relevant Australian Standards

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards

AS 1742	Manual of uniform traffic control devices
AS 1742.3-2009	Traffic control for works on roads
AS 1742.14-1996	Traffic signals
AS 1743-2001	Road signs - Specifications
AS 1744-1975	Forms of letters and numerals for road signs (known as Standard alphabets for road signs)
AS/NZS 1906	Retroreflective materials and devices for road traffic control purposes
AS/NZS 1906.1: 2007	Retroreflective sheeting
AS 4191-1994	Portable traffic signal systems
AS/NZS 4192-2006	Illuminated flashing arrow signs
AS/NZS 4602: 1999	High visibility safety garments
SAA HB 81: Various	Field guides for traffic control at works on roads
SAA HB 43: 2004	Risk management guidelines companion to AS/NZS 4360:2004

Other publications

AUSTROADS

Austroads 2008	Glossary of Austroads terms
AP-G1-2003	Guide to the Geometric Design of Rural Roads
AP-R337/09-2009	National approach to traffic control at work sites
AGRS 06/09-2009	Guide to road safety Part 6: Road safety audit.
AGTM06-2007	Guide to Traffic management – Intersection, interchanges and crossings

1.4 STANDARDS

General

Standard: To AS 1742.3 and SAA HB 81 and AP-R337/09.

1.5 INTERPRETATIONS

Abbreviations

General: For the purposes of this worksection the abbreviations given below apply:

- TCP: Traffic Control Plan.
- TGS: Traffic Guidance Scheme.
- TMP: Traffic Management Plan.

Definitions

General: For the purposes of this worksection the definitions given below apply:

Competent person: A person who has, through a combination of training, qualification and experience, acquired knowledge and skills enabling that person to correctly perform a specified task.

1.6 SUBMISSIONS

Acceptance criteria

General: All submissions will be subject to the approval of the Superintendent.

Approvals

- Traffic guidance scheme.
- Statutory approvals from council or other relevant authority.

Drawings

- Temporary roadways and detours.
- Signpost layout plan.
- Pavement marking details.

Execution details

- Schedule of working times.

1.7 INSPECTION

Notice

General: Give notice so that the inspection may be made of the following:

Summary of HOLD POINTS

Clause title/Item	Requirement	Notice for inspection	Release by
Pre-Construction Planning			
Traffic guidance scheme	Approval of Traffic guidance scheme	4 weeks before proposed commencement on site	Superintendent.
Traffic guidance scheme	Approvals from Council and other Authorities for Temporary traffic arrangement	4 weeks before proposed commencement on site	Superintendent.
Levels of Traffic Guidance Schemes	Carry out a risk assessment for works not involving complex traffic arrangements or staged works or both	4 weeks before proposed commencement on site	Superintendent.
Safety Audit	For complex traffic arrangements and staged works carry out safety audits	Progressive	Superintendent.
MATERIALS			
Barriers and fencing – Boom gates	Provide if requested	Prior to commencing works	Superintendent.
EXECUTION			
Side roads and property accesses - Access	Proposal for access	5 working days prior to carrying out works	Superintendent.
Side roads and	Approval to deny	3 working days prior to	Superintendent.

Clause title/Item	Requirement	Notice for inspection	Release by
property accesses – Notice to property owners	vehicular access and provide notice to property owners	carrying out works	
Plant and equipment – Inadequate traffic control devices	Rectify non conforming traffic control devices	1 working day of notice	Superintendent.
Temporary roadways and detours - Drainage	Pavement drainage construction	Progressive	Superintendent.
Temporary roadways and detours – Wearing surface	Width of wearing surface and position of finish tying into existing works	3 working days prior to carrying out works	Superintendent.
Temporary roadways and detours – Construction under traffic	Approval required to construct under traffic	3 working days prior to carrying out works	Superintendent.
Temporary roadways and detours – Construction under traffic	Prior notice of work commencing under traffic	5 working days prior to carrying out works	Superintendent.
Opening to traffic – Opening temporary road ways and detours to traffic	Redirection onto existing roadway in the event of failure	1 working day	Superintendent.
Opening to traffic – Opening temporary road ways and detours to traffic	Inspect and approve all roadways and detours prior to opening	2 working days prior to carrying out works	Superintendent.
Opening to traffic – Opening completed work	Written notice and procedure for road opening	5 working days prior to carrying out works	Superintendent.

Summary of WITNESS POINTS – On-site activities

Clause/Item	Requirement	Notice for inspection by the Superintendent
Pre-Construction Planning		
Traffic Guidance Scheme	Site copy of TGS	Progressive
Materials		
Barriers and fencing – Cones and bollards	Restrictions for use of cones when attended by an employee.	Progressive
Temporary markings – Line marking	Ineffective line marking, remark within 48 hours.	Progressive
Temporary markings – Old markings	Obliterate or remove old markings.	Progressive
Temporary markings – Raised Pavement markers	Replace ineffective markers within 24 hours.	Progressive
EXECUTION		
Personnel - Traffic controllers	Submit names and declaration of proposed traffic controllers	Prior to commencing work
Personnel - Traffic controllers	Additional traffic controller required where sight distance is restricted	Progressive
Personnel - Night and poor light	Flood light as required.	Progressive
Plant and equipment –	Diary and method of works	Progressive

Clause/Item	Requirement	Notice for inspection by the Superintendent
Temporary speed zoning		
Plant and equipment – Arrangement and placement of traffic control devices	To the approved TGS	Progressive
Opening to traffic – Opening temporary roadways and detours to traffic	Traffic switch requires workers on site for a minimum of 2 working days	2 working days
Opening to traffic – Maintain	Ensure safe surface for traffic	Progressive

2 PRE-CONSTRUCTION PLANNING

2.1 TRAFFIC GUIDANCE SCHEME

General

Requirement: Submit a traffic guidance scheme for approval at least 4 weeks prior to proposed commencement on site. The Traffic guidance scheme must include both the traffic management plan and the Traffic control plan. The Traffic Guidance scheme must be prepared by a competent person. Where the control of traffic does not require pavement or drainage works the period of notice will be 2 weeks. This is a **HOLD POINT**.

Obtain: All necessary approvals from Councils and other authorities for temporary traffic arrangements. This is a **HOLD POINT**.

Site copy: Keep an approved copy off the Traffic Guidance Scheme on site at all times. This must be used to check the arrangement and maintenance of traffic control devices. This is a **WITNESS POINT**.

Level of Traffic guidance schemes

Risk assessments: Carry out for (a) and (b) considering factors such as traffic volume and speed, road geometry and width and the general behaviour of road users. If the risk can not be tolerated a fully protected work site will be required. This is a **HOLD POINT**.

Levels: For traffic guidance schemes conform to the following:

- a) Short term and mobile works not involving full or part road closure.
- b) Works involving relatively simple part-roadway closures.
- c) Works involving complex traffic arrangements or staged works or both.

Traffic Management Plan

Include: The Traffic Management Plan must include the following:

- Design drawings for any temporary roadways and detours to conform with **Design drawings** showing pavement, wearing surface and drainage details.
- Details of arrangements for construction under traffic to SAA HB81.
- Traffic Control Plan(s).
- Vehicle Movement Plan (s) – Planning for movement of work vehicles including deliveries, personnel and contractors and gang trucks.
- Application for temporary speed zoning changes.
- Special consideration to the safety of the workers, pedestrians, cyclists.
- Names, addresses and means of communicating with personnel nominated for contact outside normal working hours to arrange for adjustments or maintenance of traffic control devices and temporary roadways and confirmation that this list has been supplied to the local Police.

Traffic Control Plan

Include: The Traffic Control Plan must include the following:

- A proposal to erect a Regulatory Traffic Control Device showing locations and times of operation.
- Appropriate temporary speed zoning signs.
- Boom gates.
- Portable traffic signals.
- Temporary fixed traffic signals.

- A signpost layout plan showing:
 - . Location, size and legend of all temporary signs.
 - . Temporary regulatory signs and temporary speed zones.
 - . All traffic control devices such as temporary traffic signals, linemarking, pavement reflectors, guideposts, guardfence and barrier boards.
- Working times when traffic control measures are in place to minimise disruption to traffic during periods of peak flows.
- Take particular care when requiring reversal of traffic flows or the separation of unidirectional flow by medians or other physical separation.

Safety Audit

Audit: Conduct a safety audit for the construction phase as recommended in AGRS 06/09 for complex traffic arrangements and staged works. This includes risk assessments for the workers safety. This is a **HOLD POINT**.

2.2 DESIGN

Design standards

Standard alignment and grading: Adopt the specific provisions of this worksection, AUSTROADS AP-G1, Local Authority's design standards.

Intersections: Design intersections to AUSTROADS AGTM06.

Road safety: Conform with documentation on road safety to AGRS 06/09.

Design drawings

Requirement: Submit design drawings for approval that show:

- Alignment and grading at a horizontal scale of 1:2000 for rural roads and 1:500 for urban roads. Where the temporary road rejoins the existing road, extend levels showing the full cross section along the existing road for a minimum length of 200 m.
- A sight distance diagram if opposing traffic is to use a single carriageway.
- Intersections, and any other locations where traffic may be required to make turning, merging or diverging movements, at a scale of 1:500.
- Pavement marking details.
- Sufficient cross-sections to indicate the feasibility of making connections between various parts of the work.
- Sufficient dimensions, especially lane widths, to make clear the geometry and clearances of the proposed Works.
- A north point or some other location method to orientate the plan.
- Pavement type and surface type.
- Roadside furniture.
- Drainage culverts and pits.

Design standards

As a minimum the design must incorporate the following:

Design travel speed (km/hr)

Minimum widths of traffic lanes (m)

Minimum widths of shoulders (m)

Signage

Signing: Careful considerations must be given to the signing of the work site regardless of the occupation time of the site. This includes:

- Protection of workers.
- Provision of adequate warning of changes in surface condition and the presence of personnel or plant engaged in work on the road.
- Adequate instruction of road users and their guidance safely through, around or past the work site.

3 MATERIALS

3.1 SIGNS

Specifications

Selection of signs: To AS 1742.3.

Design and manufacturing of signs : To AS 1743.

Details of each letter: To AS 1744.

Reflective material: Class 1 material complying with AS 1906.1.

Sign size: To AS 1742.3, AS 1743 and Annexure.

Signs for night work: Floodlit if outside of the car headlight beams to AS 1742.3.

Flashing arrow signs: To AS/NZS 4192 and installed to AS 1742.3 and SAA HB81.

Supplementary signs

Annexure: Signs supplementary to AS 1742.3 and AS 1743.

Use: In lieu of or in addition to those shown in AS 1743 as follows:

- Heavy machinery crossing temporary sign SW5-22 in lieu of trucks entering sign W5-22.
- Cycle hazard grooved road temporary sign ST1-10 in addition to T1-10 where the road is grooved and is a hazard to cyclists.
- Tar spraying possible short delay temporary sign ST3-1 in addition to T3-1 for bituminous surfacing works.
- Changed traffic conditions ahead temporary sign ST1-6 in addition to T1-1, T1-6, T2-6 and T2-21 on long term works, sidetracks and detours.

3.2 BARRIERS AND FENCING

Barrier boards

Standard: To AS 1742.3.

Size: 150 to 200 mm high, 4 m maximum length.

Colour: Alternate diagonal stripes of black and retroreflective yellow terminating in yellow at each end.

Retroreflective sheeting: Minimum Class 1 to AS/NZS 1906.1.

Placement: Do not place parallel to the direction of traffic flow.

Support: Mount on trestles or fixed posts at about 1 m above the pavement.

Support Material: Timber, metal or other suitable material.

Support Colour: Yellow.

Stability: Provide concrete blocks, sandbags or other approved devices to ensure barriers are stable.

Bases: Keep the bases of the trestles within the ends of the boards.

High visibility flexible mesh fencing

Standard: To AS 1742.3.

Height: Approximately 1 m.

Colour: Orange.

Support: Top of the fence is at least 800mm above ground level at all times.

Posts: Use temporary post-mounted delineators.

Location: Erect parallel to and in close proximity to traffic.

Boom gates

Type and location: As requested by the Superintendent or Local Roads Authority. This is a HOLD POINT.

Cones and bollards

Standard: To AS 1742.3.

Cones: Fluorescent red or orange material resilient to impact.

Small cones: Used in most built up areas, footpaths, shared paths, and speeds < 70 km/hr. 450 to 500 mm high.

Large cones: Minimum 700 mm high all other locations or instead of the small cones.

Spacing: To AS 1742.3 and all purposes with speed limit less than 50 km/h maximum spacing 4 m.

Bollards: Vertical tube fluorescent red or orange material resilient to impact. At least 750 mm high and 100 mm diameter.

Placement: Locate traffic cones and bollards to arrangement diagrams in SAA HB81.

Restrictions: Unless cones are firmly fixed in position use only while work is in progress, or in locations where there is an employee in attendance to reinstate any of the cones which have been dislodged by traffic. Alternatively use bollards or barriers. This is a **WITNESS POINT**.

Cones and bollards used under night conditions: White horizontal retroreflective class 1 material band, size and location to AS 1742.3.

3.3 TEMPORARY MARKINGS

Pavement reflectorised markings

Pavement markings: Include painted lines, roadmarking tape and raised pavement markers.

Standard: To AS 1742.3.

Edgeline: Where the adjoining roadway is edgeline, provide edgeline to temporary roadways.

Linemarking

Type: Pavement marking tape.

Maintenance: If the pavement linemarking becomes ineffective remark within 48 hours of direction by the Superintendent. This is a **WITNESS POINT**.

Cost: Borne by the Contractor.

Arrows

Location: If single carriageway is opened adjacent to or in lieu of an existing dual carriageway length.

Place: Pavement arrows indicating the direction of flow of traffic at not more than 500 m.

Remove: Arrows if the section is then reincorporated as dual carriageway.

Old markings

Removal: Obliterate or remove all superseded pavement markings immediately before, or after placement of, new markings. Do not obliterate by painting on a final surface. This is a **WITNESS POINT**.

Raised pavement markers

Ineffective markers: Replace raised pavement markers which have become ineffective, 24 hours of direction by the Superintendent. This is a **WITNESS POINT**.

Cost: Borne by the Contractor.

3.4 TRAFFIC SIGNALS

Portable traffic signals

Standard: To AS 4191.

Use: Short term applications of shuttle control where a single lane has to be used alternately by traffic from opposite directions or at road crossings or intersections.

Temporary fixed traffic signals

Standard: To AS 1742.14.

Design and installation of temporary fixed traffic signals: To AS 1742.14.

Use: Longer term shuttle operations or for non-shuttle control of intersecting traffic flows.

Traffic warning lamps

Installation: To AS 1742.3.

Maintain: In good working order, correctly aligned and positioned with respect to the direction of traffic flow each night, before the site is left unattended.

4 EXECUTION

4.1 SIDE ROADS AND PROPERTY ACCESSES

Access

Passage: At all times provide safe and convenient passage for vehicles, pedestrians and stock to and from side roads and property accesses connecting to the roadway.

Alternative access: Submit proposal for approval prior to commencing the work affecting access.

This is a **HOLD POINT**.

Notice to property owners

Denial of vehicular access: Where access needs to be denied due to particular construction activities undertake the following:

- Obtain the approval the of the Superintendent.
- Advise the property owners of such occurrences by way of letter drop at least 24 hours prior to such an interruption.
- Repeat this advice verbally to the property owner in a courteous manner.
- Keep these interruptions to an absolute minimum. This is a **HOLD POINT**.

4.2 PERSONNEL

Traffic controllers

Standard: To AS 1742.3 and SAA HB81.

Personnel: Submit names of proposed traffic controllers with a signed declaration that they are appropriately trained in the duties of traffic controllers to AS 1742.3 and SAA HB81. This is a **WITNESS POINT**.

Recognition marks: A distinguishing mark on the outer garment of authorised traffic controllers indicating their authority.

Location of traffic controllers: One traffic controller will remain at the head of each traffic queue while it is halted.

Restricted sight distance: An additional traffic controller must be placed at the tail end of the queue. This is a **WITNESS POINT**.

Two-way radio: Where both ends of the work are not intervisible, use two-way radio for the traffic controller at each end, or an intermediate traffic controller, from whom both other traffic controllers take their cue, is stationed where both can see extremities of the work.

Night and poor light

Wand: Use an illuminated red cone wand (torch) with a minimum capacity of 30,000 candela to control traffic.

Lighting: The traffic controller and the work area adjacent must be illuminated where possible by flood lighting. Position the flood lighting above the work area and direct downwards and incline slightly to illuminate the face of the STOP/SLOW bat. This is a **WITNESS POINT**.

Flood lighting: Must not create glare for approaching drivers.

Environmental effects: Consider the adverse effects of high lighting levels close to residential property.

Approved clothing for work personnel

Standard: To AS 1742.3, AS/NZS 4602 and SAA HB81.

Requirements: All personnel are required to wear a garment or garments of the classification appropriate for the time of work as follows:

- Class D—garments for daytime use only. Red-orange or yellow.
- Class N—garments for night-time use only. Retroreflective strips of White or yellow.
- Class D/N—garments for both day and night use. Red-orange or yellow.

Flammable: Potentially flammable clothing must not be worn close to work likely to generate flame or hot splatter / molten metal.

4.3 PLANT AND EQUIPMENT

Plant delineation

Plant and equipment: When working in a position adjacent to traffic with a projection beyond the normal width of the item, for example, a grader blade. Direct traffic around such plant and equipment as follows:

- Day light conditions: Attach a fluorescent red flag to the outer end of the projection.
- Night or poor light conditions: Provide an additional traffic controller with an illuminated red wand.

Night time Clearance

Remove plant: Where traffic is permitted to use the whole or portion of the existing road, remove all plant items and similar obstructions from the normal path of vehicles

Lateral clearance: At least 6 m where practicable, with a minimum clearance of 1.2 m.

Lamps: Flashing yellow lamps may be used to draw attention to advance signs. Do not use for delineation.

Signs and devices

Conform to the following:

- Must be installed by a competent person.
- Must be appropriate to the conditions at the work site and used to AS 1742.3 unless a competent person has carried out a risk assessment for an alternative arrangement.
- Must be erected before work commences at a work site.
- Regularly check and maintain in a satisfactory condition.
- Remove from the work site as soon as practicable after works complete including stone removal and line marking.
- Keep records of all signing and delineation at roadway or part roadway closures.
- Relocate or reposition traffic control items so they are visible and perform their regulatory function.
- Place 1m clear of the travelled path. For works taking longer than 2 weeks signs must be mounted on poles sunk into the ground and duplicated on the right side of the road if physically possible.

Temporary speed zoning

General: Conform to the following:

- Arrange for the supply of appropriate temporary speed zoning signs, including posts and fittings, for erection where a temporary speed limit has been approved by the Council Local Traffic Committee or Road Authority.
 - Erect these signs, cover the signs when the speed zone is not in use and remove the signs when the speed zone is no longer required as part of the provision for traffic as directed or approved.
 - Keep a diary recording operation times of the speed zone to be made available when requested.
- This is a **WITNESS POINT**.

Arrangement and placement of traffic control devices

Layout: To the approved **Traffic guidance scheme**, AS 1742.3 and SAA HB81. This is a **WITNESS POINT**.

Cover and/or remove: All temporary traffic control devices when no longer required without delay and maintain unambiguous safe guidance to traffic.

Maintain: All traffic control devices in accordance with AS 1742.3 so that they are in good order and in the correct positions day and night. At all times the signs should be neat, clean, clear and legible.

Unacceptable traffic control devices

Do not use: The following items for traffic control:

- Steel drums.
- Isolated or non-continuous barrier units.
- Barrier boards parallel to and within 4m of the direction of traffic flow.

Inadequate traffic control devices

Nonconforming traffic control devices: Where the Contractor fails to provide and maintain traffic control devices as specified in this worksection and to conform with the approved Traffic Guidance Scheme and Standards. This is a **HOLD POINT**.

4.4 TEMPORARY ROADWAYS AND DETOURS

Drainage

General: Construct drainage structures and drains in accordance with the following worksections:

- 1121 *Open drain, including kerbs and channel gutter.*
- 1351 *Stormwater drainage.*
- 1352 *Pipe drainage.*
- 1354 *Drainage structures.*

Design frequency: Provide for run-off due to one in five year intensity rainfall, without overflow affecting the road.

Pavement drainage: Design and construct pavements to prevent water ponding on the wearing surface or shoulders. Construct temporary formations not to dam water. This is a **WITNESS POINT**.

Temporary roadways

General: Construct Temporary roadways in accordance with the following worksections:

- 1102 *Control of erosion and sedimentation.*
- 1111 *Clearing and grubbing.*
- 1112 *Earthworks (Roadways).*
- 1141 *Flexible pavements.*

Temporary kerbing: To conform with:

- Forming temporary medians, traffic islands or pavement edges.
- Height < 150 mm.
- Securely fastened to the pavement.
- Clearly delineate.
- As seen by the approaching traffic the width must be in a continuous line of 150 mm.
- Conform to 1121 *Open drains, including kerb and channel.*

Wearing surface

General: Construct surfacing to conform with the worksections:

- 1143 *Sprayed bituminous surfacing, and/or*
- 1144 *Asphaltic concrete (Roadways).*

Quality: Firm, even and skid resistant under all weather conditions and designed to remain sound during use.

Width of the wearing surface: As shown on the drawings or width of the traffic lanes plus the width of each shoulder. This is a **WITNESS POINT**.

Tie-in to existing work: Carry the wearing surface onto any existing connecting roadway so as to finish square to the existing roadway centreline. This is a **WITNESS POINT**.

Road safety barrier

Location: On all temporary embankments where the vertical height between the edge of the shoulder and the intersection of the embankment slope and natural surface exceeds 2 m and as otherwise documented.

Type: Corrugated steel or precast concrete safety barriers.

Erection: To conform with the following:

- 1163 *Rigid concrete and road safety barrier systems (Public Domain).*
- 1194 *Non-rigid road safety barrier systems (Public Domain).*

Construction under traffic

Situation: Where a temporary roadway or a detour is not provided or available then construction under traffic is permitted provided the minimum widths are achieved. This is a **HOLD POINT**.

Minimum widths: Conform to the following:

- Through traffic on a two lane roadway a minimum of one 3.5 m lane width.
- Multilane roads minimum 3.5 m lane width in both directions.

Carriageway restoration: To a safe and trafficable state for through traffic prior to ceasing work each day.

Prior notice of work: Notify the Superintendent of the arrangements and methods for traffic control at least five working days before undertaking any work which would involve construction under traffic. This is a **WITNESS POINT**.

4.5 OPENING TO TRAFFIC

Opening temporary roadways and detours to traffic

Program: Complete all signposting, pavement marking, guard fence and portable or temporary traffic signals before the opening of temporary roadways to traffic.

Traffic switch: To a temporary roadway or detour must only occur where the Contractor's usual workforce will be on site for a minimum of two days thereafter. This is a **WITNESS POINT**.

Arrange: The opening of temporary roadways so that sections of existing roadway being replaced are not disturbed for a minimum of forty-eight hours.

Roadway failure: In the event of temporary roadway failure the traffic will be redirected back onto the existing roadway. This is a **HOLD POINT**.

Cost: Borne by the Contractor.

Inspection: Do not open temporary roadways and detours (including portable or temporary traffic signals sites) to traffic until they have been inspected and approved in writing. This is a **HOLD POINT**.

Partial completion: The use of the completed Works or part of the Works in providing for traffic is not considered as full opening to traffic and not a reason for payment under the completion of the works.

Maintain: Temporary roadways and detours and ensure the road surface is kept safe for traffic. Repair any potholes or other failures without delay. This is a **WITNESS POINT**.

Opening completed work

Prior notice: Provide the Superintendent with at least five working days written notice confirming the date of opening completed work to traffic. Determine the procedure for opening through consultation with the Superintendent and local Police. This is a **HOLD POINT**.

Complete: All permanent signposting, pavement markings, guard fence and traffic signals relevant to the completed work under the Contract prior to opening completed work to traffic.

Remove: All temporary traffic control devices no longer required for the safety of traffic, when the Works or part thereof are opened to traffic.

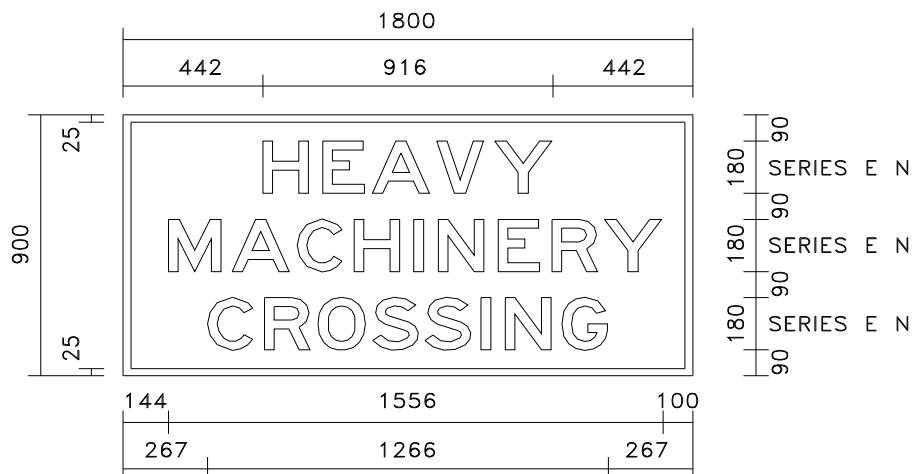
Restore: The area to a condition at least equivalent to that at commencement.

5 MEASUREMENT AND PAYMENT

Delete

6 ANNEXURES

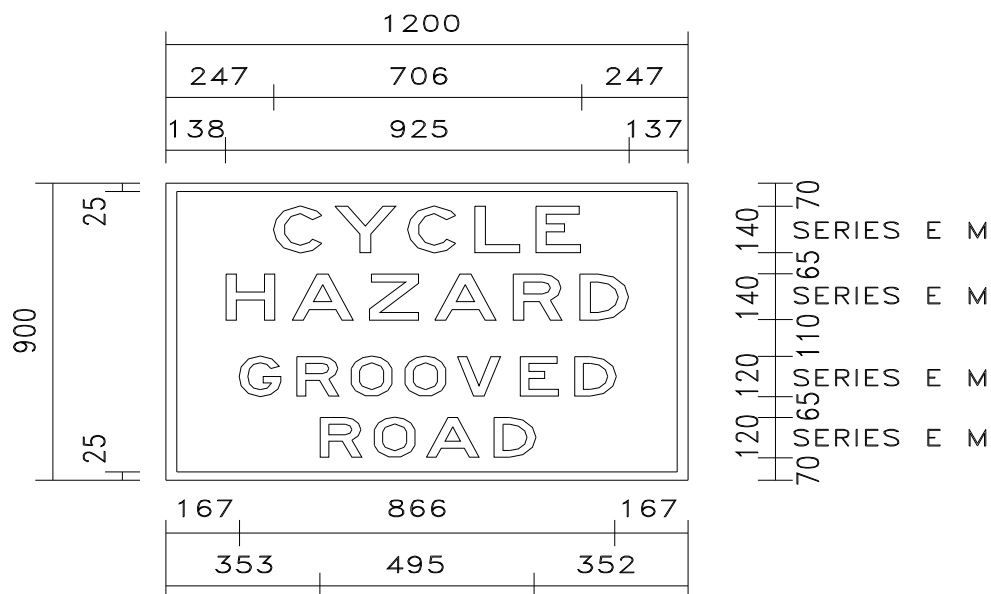
6.1 SUPPLEMENTARY TEMPORARY WARNING SIGNS IN ADDITION TO AS 1743 AND AS 1742.3.



Dimensions are in mm

Colours: Black letters and border on yellow reflectorised ground.

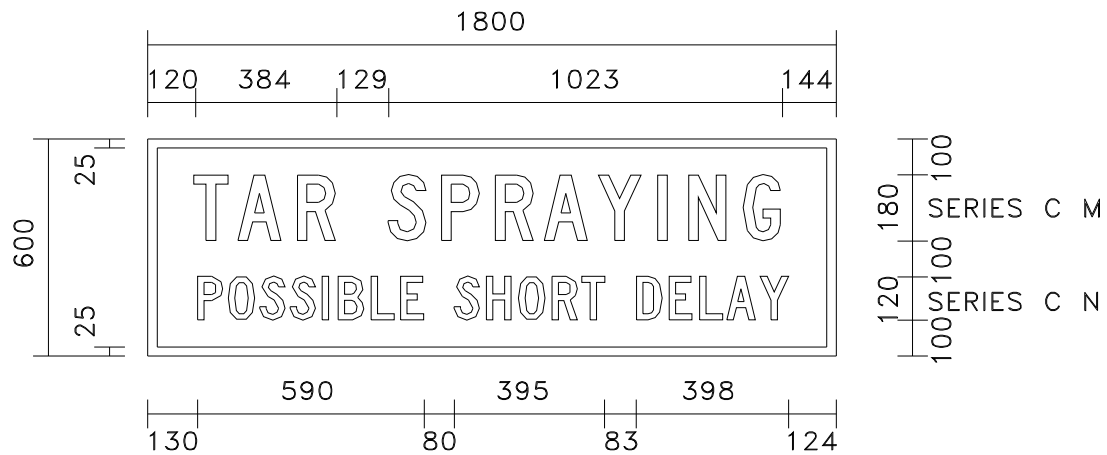
Sign SW5-22



Dimensions are in mm

Colours: Black letters and border on yellow reflectorised ground.

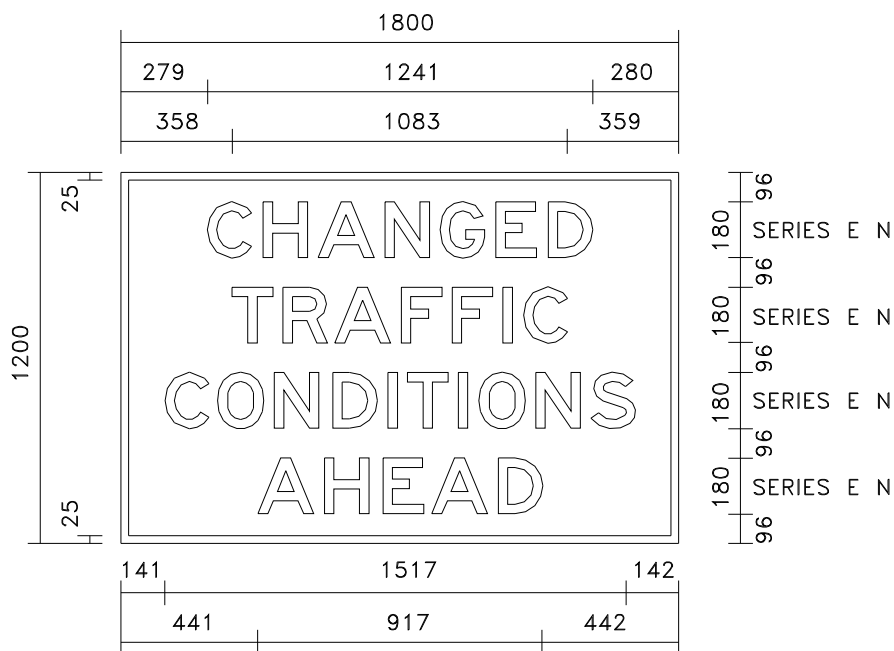
Sign ST1-10



Dimensions are in mm

Colours: Black letters and border on yellow reflectorised ground.

Sign ST3-1



Dimensions are in mm

Colours: Black letters and border on yellow reflectorised ground.

Sign ST1-6

1102 CONTROL OF EROSION AND SEDIMENTATION
--

7 GENERAL

7.1 RESPONSIBILITIES

Objectives

General: Provide the works and implement measures to control erosion and sedimentation in accordance with the following:

- The drawings.
- The approved Environmental Management Plan.

Design

Requirements: Design the control measures for erosion and sedimentation to comply with statutory requirements. Preclude any potential hazard to persons or property.

Designer: The Contractor is responsible for designing the EMP

Authority requirements: The EMP must be submitted to the Superintendent for approval prior to implementation

7.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- 0152 Schedule of rates – supply projects.
- 0161 Quality (Construction) or 0167 Integrated management.
- 0179 General requirements (Construction).
- 0257 Landscape – roadways and street trees.
- 1101 Control of traffic.
- 1111 Clearing and grubbing.
- 1112 Earthworks (Roadways).
- 1121 Open drains, including kerb and channel (gutter).

7.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Institute of Public Works Engineering Australia (IPWEA) - Local Government Salinity Management Handbook 2002 a resource guide for the public works professional.

7.4 STANDARDS

The following documents are incorporated into this worksection by reference:

- Documents: [complete/delete]
- Landcom - Environmental Guidelines for Major Construction Sites
- Managing Urban Stormwater: Soils and Construction, July 2004 Reprint 2006
- Protection of the Environment Operations Act 1997
- NSW State Legislation
- Soil Conservation Act, 1938
- Water Act, 1912

7.5 INTERPRETATIONS

Abbreviations

EMP: Environmental Management Plan.

NTU: The units of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units.

Definitions

General: For the purposes of this worksection the definitions given below apply:

- Erosion: The wearing away of land by the action of rainfall, running water, wind, moving ice or gravitational creep. Soil detachment (erosion) occurs when the erosive forces exceed the soil's resistance, causing the soil particles to move.
- Sediment: Sediment is the result of erosion, and consists of small detached soil particles. It occurs when the transportation of detached soil particles ceases or slows and the soil particles fall out of suspension.

7.6 SUBMISSIONS**Acceptance criteria**

General: All submissions will be subject to the approval of the Superintendent.

Documents

- The Environmental Management Plan.
- Program for coordination of work schedules including order of works and timing.

Drawings

- Access and haulage tracks.
- Borrow pits and stock areas.
- Compound areas.
- Features of the site.
- Relevant construction details.

Calculations

Delete

7.7 INSPECTION**Notice**

General: Give notice so that inspection may be made of the following:

Summary of HOLD POINTS

Clause/subclause	Requirement	Notice for inspection	Release by
PRE-CONSTRUCTION PLANNING			
Environmental Management Plan - General	Submit EMP with detailed section plans for each catchment area and site section	7 days before site disturbance on each section	Superintendent
EXECUTION			
Erosion and sedimentation control measures - Stockpile sites	Proposed stockpile locations	7 days before site disturbance or material delivery	Superintendent
Earthworks – Embankments and sediment removal	Survey information for volume measurement	3 working days before embankment construction or sediment removal	Superintendent

Summary of WITNESS POINTS

Clause/subclause	Requirement	Notice for inspection by the Superintendent
EXECUTION		
Erosion and sedimentation control measures - Control measures	Diversion and catch drains - constructed and lined before the adjacent ground is disturbed and the excavation is commenced	3 working days before ground disturbance
	Areas of erodible material not approved for clearing or	3 working days before the adjacent ground is disturbed

Clause/subclause	Requirement	Notice for inspection by the Superintendent
	disturbance clearly marked, fenced off or protected against disturbance	
Erosion and sedimentation control measures - Access and exit areas	Decontamination - shake-down or other methods for the removal of soil materials from motor vehicles	7 days before site disturbance
Cleaning - Sedimentation control structures	Cleaning out of permanent sedimentation control structures	3 working days before proposed clean out
Temporary erosion and sedimentation control - General	Provide temporary erosion and sedimentation control measures	7 days before site disturbance
Temporary erosion and sedimentation control - Control measures	Provide temporary sediment traps and trash barriers	3 working days before ground disturbance
Temporary erosion and sedimentation control - Maintenance	Provide access roads for inspection and maintenance sedimentation control works	Progressive
Temporary erosion and sedimentation control - Removal	Removal of temporary erosion and sedimentation control works	3 working days before each stage of progressive removal

8 PRE-CONSTRUCTION PLANNING

8.1 ENVIRONMENTAL MANAGEMENT PLAN

General

Minor works: Prepare an Environmental Management Plan covering erosion and sedimentation control.

Major works: Prepare an Environmental Management Plan and a Soil and Water Management Plan both covering erosion and sedimentation control.

Approval criteria: EMP shall be submitted to the Superintendent for approval.

Site sections: At least seven days before the natural surface is disturbed on each of these sections, submit an Environmental Management Plan for that section. Superimpose the plan on the drainage drawings of the works. This is a **HOLD POINT**.

Responsibility: Release of the Hold Point does not relieve the Contractor of the responsibility to provide whatever measures are required for the effective erosion and sedimentation control at all times.

Responsibilities

Costs: The cost of preparing, submitting and revising the Environmental Management Plan will be borne by the Contractor.

Adherence: Adhere to the approved Environmental Management Plan. Submit a revised Environmental Management Plan for approval seven days in advance of an intended variation from the approved plan.

Salinity prevention: In known salt affected areas, seek advice from the relevant land and water resource authority to ensure that the proposed Environmental Management Plan conforms to the current salinity prevention measures outlined in the IPWEA publication, *Local Government Salinity Management Handbook*.

Minimising erosion

Objective: To minimise the quantity of soil lost during construction due to land clearing and earthworks.

Content: Provide documentation and program scheduling to address the following:

- Minimum land clearance, particularly of areas of highly erodible soils and steep slopes prone to water and wind erosion.
- Progressive revegetation and mulching, as each site section is complete.
- Coordination of work schedules for multiple contractors, to avoid delays resulting in disturbed land remaining unstabilised.
- Time schedules for the construction of structures and the implementation of measures to control erosion and sedimentation. Where possible, program the work to avoid seasonal intense rain storms.
- An order of works based upon construction and stabilisation of all culverts and surface drainage works, at the earliest practical stage.
- A Time schedule to address **HOLD POINTS** and **WITNESS POINTS**.

Documentation: Implement ahead of, or in conjunction with clearing and grubbing operations (as required by *1111 Clearing and grubbing*) all permanent and temporary erosion and sedimentation control measures, including the control measures.

Site sections: For implementation divide the site into sections based on the catchment area draining to each permanent drainage structure in the works and based on the area bounded by the road reserve.

Site section information: Provide diagrams indicating the following:

- Access and haulage tracks.
- Borrow pits and stockpile areas.
- Compound areas, such as Contractor's facilities and concrete batching areas.
- Features of the site, including contours and drainage paths.
- Relevant construction details of all erosion and sedimentation control structures.

8.2 SOIL AND WATERMANAGEMENT PLAN - SUPPLEMENT

General

Objective: To minimise the generation of contaminated stormwater.

Content: Provide documentation to address the following:

- Minimising the quantity of uncontaminated stormwater entering cleared areas.
- Establishing cut-off or intercept drains to redirect stormwater away from cleared areas and sloping to stable (vegetated) areas or effective treatment installations.
- Reducing water velocities.

Preparation

Expertise: Employ the expertise of a consultant of acknowledged ability and submit details of experience.

Environmental assessment: Identify and obtain information on any relevant environmental impact that may be caused by the works.

Risk assessment: Identify and rank risks that may arise from the construction of the works.

Sediment controls

Objective: To minimise the impact of contaminated water on receiving waters.

Content: Provide documentation to address the following:

- Installing erosion and sediment control measures before construction where possible.
- Identifying drainage lines and install control measures to handle predicted stormwater and sediment loads generated in the mini catchment.
- Designing erosion and sediment run-off control measures appropriate to the site conditions to handle a one-in-two year storm event (two-year ARI with intensity of six hours), for temporary structures, and a one-in-fifty year storm event, for permanent structures.
- Documenting an inspection, maintenance and cleaning program for sediment run-off control structures.
- Creating contingency plans for unusual storm events.
- Planning for the continual assessment of the effectiveness of sediment control measures.

De-watering work sites

Objective: To ensure that de-watering operations do not result in turbid water entering natural waterways.

Content: Provide documentation to address the following with regard to de-watering by pumping:

- Treating contaminated water if the turbidity exceeds 30 NTU.
- Only pump water into natural waterways that does not exceed regulatory water quality standards.
- Pumping water, wherever practical, to vegetated areas of sufficient width to remove suspended soil, or to sediment control structures.
- Monitoring turbidity hourly, if discharge is to a natural waterway.

Dust control

Objective: To ensure there is no health risk or loss of amenity due to emission of dust to the environment.

Content: Provide documentation to address the following:

- Suppressing dust by watering.
- Installing wind fences.

Management of stockpiles and batters

Objective: To manage soil stockpiles so that dust and sediment in run-off are minimised.

Content: Provide documentation to address the following:

- Minimising the number of stockpiles, and the area and the time stockpiles are exposed.
- Separating soil and overburden stockpiles.
- Locating stockpiles away from drainage lines, at least 10 m away from natural waterways and where least susceptible to wind erosion.
- Designing stockpiles and batters with slopes no greater than 2H:1V.
- Stabilising stockpiles that will remain bare for more than 28 days by covering with mulch, anchored fabrics or seeding with sterile grass.
- Establishing sediment controls around unstabilised stockpiles and batters.

Working in waterways and floodplains

Objective: To minimise stress on aquatic communities when working in a waterway.

Content: Provide documentation to address the following:

- Planning in-stream works to minimise contact time.
- Establishing special practices to minimise impacts on the waterway and disturbance of the banks.
- Stabilising the banks and the in-stream structures so they do not contribute to the sediment load.
- Maintaining minimum flows to ensure the viability of aquatic communities. Ensure the free passage of fish.
- Designing crossings that do not contribute to the sediment load.
- Preparing a contingency plan for high-rain events.
- Preparing a reinstatement plan for work in a stream that could alter the waterway structure.

9 EXECUTION

9.1 PROVISION FOR TRAFFIC

General

Control of traffic: Conform to the following:

- Conform with *1101 Control of traffic*.
- Conform with Traffic Guidance Scheme.

9.2 EROSION AND SEDIMENTATION CONTROL MEASURES

Control measures

Construction: To the Environmental Management Plan and the drawings.

Requirement: Provide erosion and sedimentation control measures to include, but not limited to, the following:

- The installation of permanent drainage structures before the removal of topsoil and before the commencement of earthworks for formation within the catchment area of each structure.

- The prompt completion of all permanent and temporary drainage works, once commenced, to minimise the period of exposure of disturbed areas.
- The construction of diversion and catch drains to divert uncontaminated runoff from outside the site, clear of the site. Construct and line catch drains before the adjacent ground is disturbed and the excavation is commenced. This is a **WITNESS POINT**.
- To provide for the passage of uncontaminated water through the site without mixing with contaminated runoff from the site.
- The provision of contour and diversion drains across exposed areas before, during and immediately after clearing and the re-establishment and maintenance of these drains during soil removal and earthworks operations.
- The provision of sediment filtering or sediment traps, ahead of and in conjunction with earthworks operations, to prevent contaminated water leaving the site.
- The restoration of the above drainage and sedimentation control works on a day to day basis to ensure that no disturbed area is left without adequate means of containment and treatment of contaminated water.
- The limitation of areas or erodible material exposed at any time to those areas being actively worked. Clearly mark, fence off or otherwise protect any areas not approved for clearing or disturbance. This is a **WITNESS POINT**.
- The minimisation of sediment loss during construction of embankments by means such as temporary or reverse superelevations during fill placement, constructing berms along the edge of the formation leading to temporary batter flumes and short term sediment traps.
- The progressive revegetation of the site, in accordance with *0257 Landscape - Roadways and street trees*.

Stockpile sites

Location: Areas pre-approved for such use.

Protection: Provide a 5 m buffer zone to between stockpile sites and any stream or flow path. Protect all stockpiles from erosion and contamination of the surrounding area by use of the measures approved in the Environmental Management Plan. This is a **HOLD POINT**.

Access and exit areas

Decontamination: Include shake-down or other methods approved for the removal of spoil materials from construction plant or vehicles. This is a **WITNESS POINT**.

9.3 EARTHWORKS

Permanent erosion and sedimentation control basins

Planned levels: Construct earthworks for permanent erosion and sedimentation control basins to the documented levels and dimensions shown on the drawings or such levels and dimensions as determined by the Superintendent.

Site preparation: Clear the entire storage and embankment foundation area of permanent erosion and sedimentation control basins in accordance with *1111 Clearing and grubbing*. Strip topsoil and any unsuitable material under embankments to conform with *1112 Earthworks (Roadways)*.

Embankments and sediment removal

Embankments: To *1112 Earthworks (Roadways)*.

Survey information: If payment for embankment construction or sediment removal is on a Schedule of Rates basis provide survey information sufficient to subsequently measure the volume of the constructed embankment and sediment removal. This is a **HOLD POINT**.

9.4 INLETS, SPILLWAYS AND LOW FLOW OUTLETS

Sedimentation control basins and sediment traps

Rock mattresses: Construct inlets and spillways using rock filled woven galvanized steel mattresses and geotextile. Install the rock filled mattresses to conform with the requirements for rock filled wire mattress and geotextile in *1121 Open drains, including kerb and channel (gutter)*.

Plastic pipe outlet: Install a low flow outlet consisting of a 150 mm diameter plastic pipe in the locations shown on the drawings. No extra payment will be made for this work which forms part of the construction of the sedimentation control basin.

9.5 DROP INLET SEDIMENT CONTROL

Permanent traps

Timing: Construct permanent drop inlet sediment traps and inlet control banks, on completion of gully pits as shown on the drawings. These permanent drop inlet sediment traps and inlet control banks are additional to the temporary sedimentation control measures that may be required during construction of the gully pits.

Purpose: Construct the inlet control banks as required to prevent the surface flows bypassing the gully pits. The drop inlet sediment traps are to remove sediment from the surface flow before it enters the drainage system.

Sediment traps and control banks: Conform to the following:

- Construct the drop inlet sediment traps with the associated inlet control banks to consist of at least two courses of sandbags containing a 10:1 sand/cement mix as shown on the drawings.
- Key the bags at least 25 mm into the surface, dampen sufficiently to ensure hydration of the cement and tamp lightly to provide mechanical interlock between adjacent bags.

9.6 CLEANING

Sedimentation control structures

Timing: Clean out permanent sedimentation control/structures, whenever the accumulated sediment has reduced the capacity of the structure by 50% or more, or whenever the sediment has built up to a point where it is less than 300 mm below the spillway crest. This is a **WITNESS POINT**.

Pay item criteria: Clean out due to failure to provide or maintain specified erosion **Control Measures**, will not be included in pay items.

Removal of sediment: Remove accumulated sediment from permanent sedimentation control structures, in such a manner as not to damage the structures.

Disposal: Remove the sediment to a nominated soil stockpile site or dispose in such locations that the sediment will not be conveyed back into the construction areas or into watercourses.

Access: Provide and maintain suitable access to permanent sedimentation control structures, to allow cleaning out in all weather conditions.

Completion

Cleaning: Clean all permanent sedimentation control structures, prior to Practical Completion of the Works.

9.7 TEMPORARY EROSION AND SEDIMENTATION CONTROL

General

Continuous control: Ensure that effective erosion and sedimentation control is provided at all times during the contract. Remove and/or reinstate any temporary or redundant control works at appropriate times during the contract as directed by the Superintendent.

Runoff: Prior to dispersing any runoff must be free of pollutants as defined in the relevant legislation. Disperse clean runoff to stable areas or natural water courses.

Control: Provide temporary erosion and sedimentation control measures where the natural surface is disturbed by construction, including roads, depot and stockpile sites. This is a **WITNESS POINT**.

Maintenance: Provide and maintain slopes, crowns and drains on all excavations and embankments to ensure satisfactory drainage at all times. Do not allow water to pond on the works unless such ponding is part of an approved Environmental Management Plan.

Control measures

Temporary drains: Control runoff from areas exposed during the work by construction of temporary contour drains and/or temporary diversion drains, which take the form of a channel constructed across a slope with a ridge on its lower side. They may require progressive implementation and frequent alteration as the work progresses.

Contour drains: Provide contour drains across the natural surface at approximately the same elevation. Immediately after a construction site is cleared, intercept and divert runoff from the site to nearby stable areas at non-erosive velocities. Construct as follows:

- Contour drains, as shown on the drawings, formed with a grade of not less than 1% or greater than 1.5% and spaced at intervals of not less than 20 m or greater than 50 m, depending on the erodibility of the exposed soil.

Diversion drains: Provide diversion drains across haul roads and access tracks when such roads and access tracks are identified as constituting an erosion hazard due to their steepness, soil erodibility or potential for concentrating runoff flow, constructed as follows:

- Formed to intercept and divert runoff from the road or track to stable outlets.
- Spacing of diversion drains not greater than that required to maintain runoff at non-erosive velocities.

Temporary sediment traps: Provide devices during construction to remove sediment from runoff flowing from areas of 0.5 ha or more before the runoff enters stormwater drainage systems, natural water courses or adjacent land. This is a **WITNESS POINT**.

Trash barriers: Provide and maintain trash barriers to prevent debris from entering natural watercourses.

Batter protection: Take all necessary action to protect batters from erosion during the contract. Minimise scour of newly-formed fill batters during and after embankment construction by diverting runoff from the formation away from the batter until vegetation is established.

Maintenance

Maintenance and inspection: Inspect all temporary erosion and sedimentation control works after each rain period and during periods of prolonged rainfall. Rectify any defects revealed by such inspections immediately. Clean, repair and augment, as required, the works, to ensure effective erosion and sedimentation control thereafter.

Access: Provide and maintain access from within the road reserve, or from other acceptable locations, for clearing out sedimentation control works. This is a **WITNESS POINT**.

Removal

Timing: Remove all temporary erosion and sedimentation control works when revegetation is established on formerly exposed areas before the end of the contract. Remove from the site or otherwise dispose, all materials and components used for the temporary erosion and sedimentation control works. This is a **WITNESS POINT**.

10 MEASUREMENT AND PAYMENT

Payment shall be calculated on an individual project basis in accordance with the schedule of rates.

1121 OPEN DRAINS INCLUDING KERB AND CHANNEL (GUTTER)

1 GENERAL**1.1 RESPONSIBILITIES****Objectives**

General: Provide all types of open drains including unlined and lined open drains, kerb and/or channel (gutter) and rock filled wire mattresses and gabions.

Performance

Requirements: Construct open drains to the specification and dimensions shown on the drawings.

Selections: As documented.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- *Schedule of rates – supply projects.*
- *0161 Quality (Construction) or 0167 Integrated management.*
- *0179 General requirements (Construction).*
- *0257 Landscape – roadways and street trees.*
- *0319 Minor concrete works.*
- *1101 Control of traffic.*
- *1102 Control of erosion and sedimentation.*
- *1352 Pipe drainage.*

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards

AS 1289	Methods of testing soils for engineering purposes
AS 1289.5.4.1-2007	Soil compaction and density tests—Compaction control test—Dry density ratio, moisture variation and moisture ratio
AS 1289.5.5.1-1998	Soil compaction and density tests—Determination of the minimum and maximum dry density of a cohesionless material—Standard method
AS 1289.5.7.1-2006	Soil compaction and density tests—Compaction control test—Hilf density ratio and Hilf moisture variation (rapid method)
AS 2758	Aggregates and rock for engineering purposes
AS 2758.4-2000	Aggregate for gabion baskets and wire mattresses
AS 2876-2000	Concrete kerbs and channels (gutters)—Manually or machine placed
AS 3704 – 2005	Geosynthetics – Glossary of terms
AS 3705 – 2003	Geotextiles: Identification, marking and general data
AS/NZS 4534: 2006	Zinc and zinc/aluminium-alloy coatings on steel wire

Other publications

AUSTROADS 2008	Glossary of Austroads terms
AGPT04G/09-2009	Guide to Pavement Technology Part4G- Geotextiles and geogrids
ASTM A975 – 97	Double-twisted hexagonal mesh gabions andrevet mattresses (Metallic coated steel wire or metallic coated steel wire and PVC coatings)

1.4 INTERPRETATIONS**Definitions**

General: For the purposes of this worksection the definition given below applies:

- Kerb and channel (gutter): Includes all forms of concrete channels (gutters), dish drains, grated drains, and mountable median and barrier kerbing.

- Open drains: All drains other than pipe and box culverts and include catch drains, channels (gutters) and kerbs and channels (gutters).

1.5 SUBMISSIONS

Acceptance criteria

General: All submissions will be subject to the approval of the Superintendent.

Documents

General: Submit the following documents for approval:

- Calculations:
 - . Proposals for temporary drainage and changed hydraulic capacity.
- Design:
 - . Temporary works details.
 - . Traffic guidance scheme.
 - . Temporary drainage plan.
 - . Road opening permit.
- Drawings:
 - . Locations of driveways and laybacks.
 - . Gully pit hydraulic capacity.
- Execution:
 - . Trial section.
- Manuals: [complete/delete]
- Technical data:
 - . Components for concrete materials and drainage structures, material for backfill, rock filled gabions, pipe work and precast products.
 - . Compaction data on earth materials as specified.
 - . Materials for gabions and mattress mesh, concrete in situ/precast, pipes.
- Calculations:
 - . Survey set-out data for gradients and table drains.
- Technical data:
 - . Compaction data on earth materials as specified.
 - . Survey data for construction to tolerances.

1.6 INSPECTION

Notice

General: Give notice so that the inspection may be made of the following:

Summary of HOLD POINTS

Clause title/Item	Requirement	Notice for inspection	Release by
PRE-CONSTRUCTION PLANNING			
Authority Approvals			
- Provision for traffic	Submit Traffic Guidance Scheme for approval	2 weeks prior to site commencement	Superintendent
- Temporary drainage	Submit details of procedures/devices for approval	2 weeks prior to site commencement	Superintendent
MATERIALS			
Concrete	NATA compliance certificates for concrete and constituents	7 days prior to commencement on site	Superintendent
Joint Fillers and sealants	NATA compliance certificates for proposed joint filler	7 days prior to commencement on site	Superintendent

Clause title/Item	Requirement	Notice for inspection	Release by
Proprietary Products	Submit proprietary products and manufacturers instructions	7 days prior to commencement on site	Superintendent
EXECUTION			
Open drains			
- Excavation	Approval to divert drain to avoid trees and/or rocks.	1 working day before set-out.	Superintendent.
- Excavation	Location and construction of drains to prevent salination	1 working day before set-out.	Superintendent.
Kerb and channel (gutter)			
- Foundation	Approval for shape and compaction of foundation material.	1 working day before forming	Superintendent
- Construction	Submit details of proposed method	14 days prior to commencement on site	Superintendent
Backfilling and reinstatement			
- Gully pits	Submit details for fixing to existing works for approval	1 working day before demolition	Superintendent
- Gully pits	Hydraulic capacity changes	7 days prior to commencement on site	Superintendent

Summary of WITNESS POINTS – On-site activities

Clause title/Item	Requirement	Notice for inspection
EXECUTION		
Open drains		
- Excavation	Unsuitable material removal and disposal	Progressive
- Excavation	Spoil site locations	Prior to placement
- Embankment	Embankment compaction and revegetation	Progressive
- Construction	Grade and compaction of open drains	Progressive
- Construction	Proprietary items installed to manufacturers recommendations	Progressive
- Types	Maintain catch drains	Progressive
- Types	Construct minor diversion and contour drains, table drains, swales and depressed medians	Progressive
- Types	Channels preserving the existing stream bed	Progressive
Lining		
- Concrete lining	Joints and tolerances	1 working day before concreting.
- Stone pitching	Bedding material and placement	1 working day before concreting.
Kerb and channel (gutter)		

Clause title/Item	Requirement	Notice for inspection
- Stormwater outlets	Direction for other than flexible pipework	1 week before ordering
- Vehicular or pedestrian access	Laybacks confirmation	3 working days prior to works
Backfilling and reinstatement		
- Backfill behind kerbs	Backfilling timing, material and compaction	1 working day prior to backfilling
- Pavement backfill	Backfill adjacent new gutter material and location	3 working days prior to works

2 PRE-CONSTRUCTION PLANNING

2.1 AUTHORITY APPROVALS

Provision for traffic

Documentation: Submit a Traffic Guidance Scheme for control of vehicular and pedestrian traffic to conform with *1101 Control of traffic*. Construct the works with the least possible obstruction to traffic, both vehicular and pedestrian. This is a **HOLD POINT**.

Temporary drainage

Documentation: Submit details of procedures/devices to maintain effective drainage of the works area during construction. This is a **HOLD POINT**.

Road opening permit

Application: Submit application to the relevant council for approval to undertake works to road or footpath. This application includes but is not limited to the following information:

- Ascertain the location of services.
- Opening and compaction specifications.

2.2 ESTABLISHMENT

Documentation

Survey control: Required for the following:

- Mapping and pegging the drainage system.
- Locating components.

3 MATERIALS

3.1 CONCRETE

General

Standard: To AS 2876

Specification: Concrete properties and delivery, placing, compaction, finishing, curing and protection to conform with *0319 Minor concrete works*.

Documentation: Submit NATA registered Compliance Certificates for all constituents of the mix as verification of the mix suitability. This is a **HOLD POINT**.

3.2 JOINT FILLERS AND SEALANTS

General

Documentation: Submit preformed joint filler proposed for use at least 7 days prior to use in the works. Supply NATA registered compliance certificates. This is a **HOLD POINT**.

3.3 PROPRIETARY PRODUCTS

General

Approval: Use only proprietary products to conform with the manufacturers instructions. This is a **HOLD POINT**.

3.4 WIRE MATTRESSES

Delete

3.5 GABIONS

Delete

3.6 LACING AND CONNECTING WIRE

Delete

3.7 ROCK FILL MATERIAL

Delete

3.8 GEOTEXTILE

Delete

Delivery and storage

Delete

4 EXECUTION

4.1 OPEN DRAINS

Delete

Embankment

Delete

Construction

Delete

Types

Delete

4.2 LINING

Delete

Organic fibre mat and vegetation

Delete

Concrete lining

Delete

Stone pitching

Delete

Batter drains

Delete

4.3 KERB AND CHANNEL (GUTTER)

Foundation

Shape and compaction: Before placing any kerb and/or channel (gutter), shape and compact the foundation material to an approved firm base.

Relative compaction: To AS 2876 except where placed on pavement courses, then to the requirements of the respective pavement course. This is a **HOLD POINT**.

Construction

Construct: Kerb and/or channel (gutters) in fixed forms, by extrusion or by slip forming to AS 2876.

Submit: Details of method proposed including type of extrusion or slipform, concrete properties, equipment and finish. This is a **HOLD POINT**.

Trial section

Trial section: Provide a trial section to demonstrate the Contractors capability of forming equipment. This is a **HOLD POINT**.

Finish

Finish true to line: The top and face of the finished kerb and channel.

Top surface: Uniform width, free from humps, sags and other irregularities.

Type: Steel float finish or as otherwise shown on drawings.

Tolerances

Finished levels of channel / gutter surface: Within ± 10 mm of design levels.

Surface deviation of kerb face and channel (gutter) surface: ± 5 mm from the edge of a 3 m straight edge, except at kerb laybacks, grade changes or curves, or at gully pits requiring channel/gutter depression.

Joints

Contraction joints: Unless shown otherwise on the drawings, conform to the following:

- Width: 5 mm minimum.
- Depth: 20 mm.
- Intervals: Every 3 m of channel / gutter length for a minimum of 50% of cross sectional area of concrete.
- Tooling: 20 mm in depth to form a neat groove of 5 mm minimum width.

Expansion joints: Provide where the channel/gutter abuts against pits, retaining walls, overbridges and at both sides of kerb laybacks for vehicular or pedestrian access. Unless shown otherwise on the drawings, conform to the following:

- Width: 15 mm.
- Depth: Full depth of kerb and channel (gutter).
- Maximum intervals: 15 m.

Joints adjacent to concrete pavement: If kerbs and/or channel / gutters are cast adjacent to a concrete pavement, continue the contraction, construction and expansion joints documented for the concrete base across the kerb and/or channel (gutter).

Stormwater outlets

General: Reconnect and extend all existing house stormwater outlets through the kerb to match the existing type and size of pipe as shown on the drawings.

Pipes: Conform to the requirements for flexible pipes in *1352 Pipe drainage* or as directed for other types of pipe. This is a **WITNESS POINT**.

Vehicular or pedestrian access

Barrier kerb: Discontinue opposite all driveways as shown on the drawings or as directed.

Kerb laybacks: As shown on the drawings where the barrier kerb is discontinued.

Footpath crossovers: Meet the laybacks as shown on the drawings or reinstate to match existing materials. This is a **WITNESS POINT**.

4.4 BACKFILLING AND REINSTATEMENT

Backfill behind kerbs

Timing: Not earlier than 3 days after concreting, backfill and reinstate the spaces on both sides of the kerb and/or channel (gutter) to conform with the drawings, or as directed.

Material: Granular material, free of organic material, clay and rock in excess of 50 mm diameter, or approved material.

Layers: Compact in layers not greater than 150 mm thick.

Relative compaction: 95% when tested in conformance with AS 1289.5.4.1 for standard compactive effort.

Surface treatment: Free draining and free from undulations and trip hazards. This is a **WITNESS POINT**.

Pavement backfill

Backfill: Material adjacent to the new channel (gutter) as shown on the drawings or as directed. This is a **WITNESS POINT**.

Gully pits

Reconstruct: The top of gully pits or adjust precast units to suit new kerb and channel (gutter) profile to conform with 0319 *Minor concrete works*.

Adjustment: Demolish and reconstruct gully pits to suit new line or level of the kerb and channel (gutter) to match the design standard of the existing gully pit.

Fixing to existing works: Fix new wall sections in concrete or brick securely to the retained wall section. Submit details of the proposed procedure for approval. This is a **HOLD POINT**.

Hydraulic capacity: Retain or improve the capacity of the original gully pit. Cavity shapes to be regular and oriented so as not to impede flow into and out of the pit.

Submit: Provide sketches and/or calculations relevant to such hydraulic capacity. This is a **HOLD POINT**.

4.5 ROCK FILLED WIRE MATTRESSES AND GABIONS

Delete

4.6 LIMITS AND TOLERANCES

The limits and tolerances applicable to this worksection are summarised in **Summary of limits and tolerances table**.

Summary of limits and tolerances table

Activity	Limits/Tolerances	Worksection Clause/subclause
Materials		
Kerb and channel		
Kerb and channel (gutter)		Execution
-Relative compaction of foundation	To AS 2876	Foundation
-Finished levels of channel (gutter) surface	Level \pm 10 mm of design level	Kerb and channel (gutter) -Tolerances
-Surface deviation of kerb face and channel (gutter) surface	\pm 5 mm from 3 m straight edge	Kerb and channel (gutter) -Tolerances
-Contraction joints	Width: \geq 5 mm Depth: 20 mm Intervals every 3 m of channel/gutter length for a minimum of 50% of CS area of concrete	Kerb and channel (gutter) - Joints
-Expansion joint interval	\leq 15 m Width: 15 mm Depth: Full depth of kerb and channel (gutter)	Kerb and channel (gutter) - Joints
Backfill behind kerb		
-Layer thickness	\leq 150 mm	Backfilling and reinstatement
-Relative compaction	95% (standard compaction)	Backfilling and reinstatement

5 MEASUREMENT AND PAYMENT

In accordance with the schedule of rates

1122 KERB AND CHANNEL (GUTTER) REPLACEMENT

6 GENERAL

6.1 RESPONSIBILITIES

Objectives

General: Remove and dispose of existing kerb and channel (gutter) and provide new kerb and channel (gutter) and associated works

Existing works: Conform to the position of existing works.

6.2 CROSS REFERENCES

General

Requirement: Conform to the following:

- 0152 *Schedule of rates – supply projects.*
- 0161 *Quality (Construction) or 0167 Integrated management.*
- 0179 *General requirements (Construction).*
- 0319 *Minor concrete works.*
- 1101 *Control of traffic.*
- 1352 *Pipe drainage.*

6.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards

AS 1289	Methods of testing soils for engineering purposes
AS 1289.5.4.1 – 2007	Soil compaction and density tests – Compaction control test – Dry density ratio, moisture variation and moisture ratio
AS 2876-2000	Concrete kerbs and channels (gutters)—Manually or machine placed

Other publications

Austroads	Glossary of Austroads Terms 2008
IPWEA – NAMS.AU-2008	Practice note 2 Kerb and channel (gutter)

6.4 STANDARD

General

Standard: To AS 2876.

6.5 INTERPRETATIONS

Definitions

General: For the purposes of this worksection the definition given below applies:

Kerb and channel (gutter): Includes all forms of concrete channels (gutters), dish drains and mountable median and barrier kerbing.

6.6 SUBMISSIONS

Acceptance criteria

General: All submissions will be subject to the approval of the Superintendent.

Documents

Submit the following for approval:

- Design:
 - . Temporary works.
 - . Traffic guidance scheme
 - . Temporary drainage plan

- . Road opening permit
- Drawings:
 - . Location of driveways and laybacks
 - . Gully pit hydraulic capacity.
- Execution details: Trial section.

Technical data:

- . Components: Concrete, material for backfill, pipes as specified, precast products.
- . Compaction data on earth materials.
- . Calculations: Proposals for temporary drainage and changed hydraulic capacity.
- . Technical data: Survey data for construction to tolerances.
- Type test results: Data on extrusion/slip forming performance as required.

6.7 INSPECTION

Notice

General: Give notice so that the inspection may be made of the following:

Summary of HOLD POINTS

Clause title / Item	Requirement	Notice for inspection	Release by
PRE-CONSTRUCTION PLANNING			
Authority Approvals			
- Provision for traffic	Submit Traffic Guidance Scheme for approval	2 weeks prior to site commencement	Superintendent
- Temporary drainage	Submit details of procedures/devices for approval	2 weeks prior to site commencement	Superintendent
MATERIALS			
Concrete	NATA compliance certificates for concrete and constituents	7 days prior to commencement on site	Superintendent
Joint Fillers and sealants	NATA compliance certificates for proposed joint filler	7 days prior to commencement on site	Superintendent
Proprietary Products	Submit proprietary products and manufacturers instructions	7 days prior to commencement on site	Superintendent
EXECUTION			
Removal and disposal, Disposal	Approval for disposal site for excavated material	2 working days prior to excavation	Superintendent
Foundation	Approval for shape and compaction of foundation material.	1 working day before forming	Superintendent
Kerb and channel (gutter)			
- Method	Submit details of proposed method	14 days prior to commencement on site	Superintendent
- Trial section	Demonstrate the capability of forming equipment	3 working days prior to commencement on site	Superintendent
Backfilling and reinstatement			
- Gully pits	Submit details for fixing to existing works for approval	1 working day before demolition	Superintendent

Clause title / Item	Requirement	Notice for inspection	Release by
- Gully pits	Hydraulic capacity changes	7 days prior to commencement on site	Superintendent

Summary of WITNESS POINTS – On-site activities

Clause title / Item	Requirement	Notice for inspection
EXECUTION		
Removal and disposal		
- Footpath and road pavement	Assess preconstruction condition of footpath and road pavement	3 working days prior
- Footpath and road pavement	Location of saw-cutting of existing redundant kerb and gutter	1 working day before setting out
- Footpath and road pavement	Restoration of footpath to pre-construction condition	Prior to completion of works
- Services	Reinstate pipes and services	1 working day before completing reinstatement
Kerb and channel (gutter)		
- Stormwater outlets	Direction for other than flexible pipework	1 week before ordering
- Vehicular or pedestrian access	Laybacks confirmation	3 working days prior to works
Backfilling and reinstatement		
- Backfill behind kerbs	Backfilling timing, material and compaction	1 working day prior to backfilling
- Pavement backfill	Backfill adjacent new gutter material and location	3 working days prior to works

7 PRE-CONSTRUCTION PLANNING

7.1 AUTHORITY APPROVALS

Provision for traffic

Documentation: Submit a Traffic Guidance Scheme for control of vehicular and pedestrian traffic to conform with *1101 Control of traffic*. Construct the works with the least possible obstruction to traffic, both vehicular and pedestrian. This is a **HOLD POINT**.

Temporary drainage

Documentation: Submit details of procedures/devices to maintain effective drainage of the works area during construction. This is a **HOLD POINT**.

Road opening permit

Application: Submit application to the relevant council for approval to undertake works to road or footpath. This application includes but is not limited to the following information:

- Ascertain the location of services.
- Opening and compaction specifications.

8 MATERIALS

8.1 CONCRETE

General

Standard: To AS 2876.

Specification: Concrete properties and delivery, placing, compaction, finishing, curing and protection to conform with *0319 Minor concrete works*.

Documentation: Submit NATA registered Compliance Certificates for all constituents of the mix as verification of the mix suitability. This is a **HOLD POINT**.

8.2 JOINT FILLERS AND SEALANTS

General

Documentation: Submit preformed joint filler proposed for use at least 7 days prior to use in the works. Supply NATA registered compliance certificates. This is a **HOLD POINT**.

8.3 PROPRIETARY PRODUCTS

General

Approval: Use only proprietary products to conform with the manufacturers instructions. This is a **HOLD POINT**.

9 EXECUTION

9.1 REMOVAL AND DISPOSAL

Footpath and road pavement

Pre-construction Inspection: Assess the condition of the footpath, driveways and road pavement surrounding the area of kerb and channel (gutter) involved in the works. This is a **WITNESS POINT**.

Saw-cut: Along the footpath, driveways and road pavement where shown on the drawings or as directed. Minimise damage and disturbance to the remainder of the footpath and road pavement. This is a **WITNESS POINT**.

Damage to footpath: Reinstate footpath, driveways and/or road pavement damaged or disturbed by the work to their approved pre-construction condition. This is a **WITNESS POINT**.

Costs: Borne by the Contractor including restoration works.

Excavation

Extent: Demolish and remove the existing redundant kerb and channel (gutter) and excavate to the level shown on the drawings.

Method: Conform to *0319 Minor concrete works*.

Services

Existing services: Carefully remove kerb and channel (gutter) so as to prevent damage to existing services, including existing stormwater drainage pipes which discharge into the channel / gutter.

Damaged services: Restore stormwater drainage pipes and/or other services damaged by the works to their pre-construction condition. This is a **WITNESS POINT**.

Costs: Borne by the Contractor.

Disposal

General: Remove excavated material and demolished kerb and channel (gutter) from site and legally dispose of to an approved site. This is a **HOLD POINT**.

9.2 FOUNDATION

General

Shape and Compaction: Before placing any kerb and/or channel (gutter), shape and compact the foundation material to an approved firm base.

Relative compaction: To AS 2876 except where placed on pavement courses, then to the requirements of the respective pavement course. This is a **HOLD POINT**.

9.3 KERB AND CHANNEL (GUTTER)

Method

Construct: Kerb and/or channel (gutters) in fixed forms, by extrusion or by slip forming to AS 2876.

Submit: Details of method proposed including type of extrusion or slipform, concrete properties, equipment and finish. This is a **HOLD POINT**.

Trial section

Trial section: Provide a trial section to demonstrate the Contractors capability of forming equipment. This is a **HOLD POINT**.

Finish

Finish true to line: The top and face of the finished kerb and channel.

Top surface: Uniform width, free from humps, sags and other irregularities.

Type: Steel float finish or as otherwise shown on drawings.

Tolerances

Finished levels of channel/gutter surface: Within ± 10 mm of design levels.

Surface deviation of kerb face and channel (gutter) surface: ± 5 mm from the edge of a 3 m straight edge, except at kerb laybacks, grade changes or curves, or at gully pits requiring channel/gutter depression.

Joints

Contraction joints: Unless shown otherwise on the drawings, conform to the following:

- Width: 5 mm minimum.
- Depth: 20 mm.
- Intervals: Every 3 m of channel/gutter length for a minimum of 50% of cross sectional area of concrete.
- Tooling: 20 mm in depth to form a neat groove of 5 mm minimum width.

Expansion joints: Provide where the channel/gutter abuts against pits, retaining walls, overbridges and at both sides of kerb laybacks for vehicular or pedestrian access. Unless shown otherwise on the drawings, conform to the following:

- Width: 15 mm.
- Depth: Full depth of kerb and channel (gutter).
- Maximum intervals: 15 m.

Joints adjacent to concrete pavement: If kerbs and/or channel / gutters are cast adjacent to a concrete pavement, continue the contraction, construction and expansion joints documented for the concrete base across the kerb and/or channel (gutter).

Stormwater outlets

General: Reconnect and extend all existing house stormwater outlets through the kerb to match the existing type and size of pipe as shown on the drawings.

Pipes: Conform to the requirements for flexible pipes in *1352 Pipe drainage* or as directed for other types of pipe. This is a **WITNESS POINT**.

Vehicular or pedestrian access

Barrier kerb: Discontinue opposite all driveways as shown on the drawings or as directed.

Kerb laybacks: As shown on the drawings where the barrier kerb is discontinued.

Footpath crossovers: Meet the laybacks as shown on the drawings or reinstate to match existing materials. This is a **WITNESS POINT**.

9.4 BACKFILLING AND REINSTATEMENT**Backfill behind kerbs**

Timing: Not earlier than 3 days after concreting, backfill and reinstate the spaces on both sides of the kerb and/or channel (gutter) to conform with the drawings, or as directed.

Material: Granular material, free of organic material, clay and rock in excess of 50 mm diameter, or approved material.

Layers: Compact in layers not greater than 150 mm thick.

Relative compaction: 95% when tested to conform with AS 1289.5.4.1 for standard compactive effort.

Surface treatment: Free draining and free from undulations and trip hazards. This is a **WITNESS POINT**.

Pavement backfill

Backfill: Material adjacent to the new channel (gutter) as shown on the drawings or as directed. This is a **WITNESS POINT**.

Gully pits

Reconstruct: The top of gully pits or adjust precast units to suit new kerb and channel (gutter) profile to conform with 0319 *Minor concrete works*.

Adjustment: Demolish and reconstruct gully pits to suit new line or level of the kerb and channel (gutter) to match the design standard of the existing gully pit.

Fixing to existing works: Fix new wall sections in concrete or brick securely to the retained wall section. Submit details of the proposed procedure for approval. This is a **HOLD POINT**.

Hydraulic capacity: Retain or improve the capacity of the original gully pit. Cavity shapes to be regular and oriented so as not to impede flow into and out of the pit.

Submit: Provide sketches and/or calculations relevant to such hydraulic capacity. This is a **HOLD POINT**.

9.5 LIMITS AND TOLERANCES

The limits and tolerances applicable to this worksection are summarised in **Summary of limits and tolerances table**.

Summary of limits and tolerances table

Activity	Limits/Tolerances	Worksection Clause/ subclause
Kerb and channel (gutter)		Execution
-Relative compaction of foundation	To AS 2876	Foundation
-Finished levels of channel (gutter) surface	Level \pm 10 mm of design level	Kerb and channel (gutter) - Tolerances
-Surface deviation of kerb face and channel (gutter) surface	\pm 5 mm from 3 m straight edge	Kerb and channel (gutter) - Tolerances
-Contraction joints	Width: \geq 5 mm Depth: 20mm Intervals every 3 m of channel / gutter length for a minimum of 50% of CS area of concrete Tooling: 20 mm in depth to form a neat groove of 5 mm minimum width.	Kerb and channel (gutter) - Joints
-Expansion joint interval	\leq 15 m Width: 15 mm Depth: full depth of kerb and channel (gutter)	Kerb and channel (gutter) - Joints
Backfill behind kerb		
-Layer thickness	\leq 150 mm	Backfilling and reinstatement
-Relative compaction	95% (standard compaction)	Backfilling and reinstatement

10 MEASUREMENT AND PAYMENT

In accordance with the schedule of rates

1192 SIGNPOSTING

1 GENERAL**1.1 RESPONSIBILITIES****Objectives**

General: Provide signs and support structures for Regulatory, Warning and Guide signs, proprietary Street Name and Community Facility Name Signs and adjust existing signs, as documented.

Performance

Requirements: Supply, erect and adjust the signs and support structures to conform with this worksection and as shown on the drawings.

Selections: As documented.

1.2 CROSS REFERENCES**General**

Requirement: Conform to the following:

- 0152 *Schedule of rates – supply projects.*
- 0161 *Quality (Construction) or 0167 Integrated management.*
- 0179 *General requirements (Construction).*
- 0319 *Minor concrete works.*
- 1101 *Control of traffic.*

1.3 REFERENCED DOCUMENTS

The following documents are incorporated into this worksection by reference:

Standards

AS 1163-1991	Structural steel hollow sections.
AS 1214-1983	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series).
AS 1379-2007	Specification and supply of concrete.
AS/NZS 1554	Structural steel welding.
AS/NZS 1554.1: 2004	Welding of steel structures.
AS 1580	Paints and related materials—Methods of test.
AS 1580.108.2: 2004	Dry film thickness—Paint inspection gauge.
AS/NZS 1580.602.2: 1995	Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°.
AS 1627	Metal finishing – Preparation and pre-treatment of surface
AS 1627.1: 2003	Removal of oil, grease and related contamination
AS 1627.4: 2005	Abrasive blast cleaning of steel
AS 1627.9: 2002	Pictorial surface preparation standards for painting steel surfaces
AS/NZS 1734: 1997	Aluminium and aluminium alloys—flat sheet, coiled sheet and plate.
AS 1742	Manual of uniform traffic control devices.
AS 1742.5-1997	Street name and community facility name signs
AS 1743-2001	Road signs—Specifications.
AS 1744-1975	Forms of letters and numerals for road signs.
AS/NZS 1866: 1997	Aluminium and aluminium alloys—Extruded rod, bar, solid and hollow shapes.
AS/NZS 2311: 2009	Guide to painting of buildings.
AS 2700-1996	Colour standards for general purposes.
AS/NZS 3678: 1996	Structural steel—Hot-rolled plates, floorplates and slabs.
AS/NZS 3679	Structural steel.
AS/NZS 3679.1: 1996	Hot-rolled bars and sections.
AS 4100-1998	Steel in structures.
AS/NZS 4671: 2001	Steel reinforcing materials.

AS/NZS 4680: 2006

Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.

Other publications

Austroads

Glossary of Austroads Terms 2008

1.4 STANDARDS**General**

Standard: To AS 1742.

Road signs: To AS 1743.

Letters and numerals for road signs: AS 1744.

1.5 SUBMISSIONS**Acceptance criteria**

General: All submissions will be subject to the approval of the Superintendent.

Documents

- Proposed supplier.
- Materials and components: Submit alternatives for non-reflective materials where relevant.
- Execution details: Submit details of set-out.

1.6 INSPECTION**Notice**

General: Give notice so that the inspection may be made of the following:

Summary of HOLD POINTS

Clause/subclause	Requirement	Notice for inspection	Release by
Street and community facility name signs			
Approval	Details of manufacturer materials and attachment systems	1 week prior to commencement of manufacture	Superintendent
Regulatory, warning and guide signs			
General	Evidence that materials and parts proposed comply with worksection requirements	1 week prior to engaging supplier	Superintendent
Retro-reflective material for background and legend	Details of material and compatibility in application and durability	1 week prior to ordering	Superintendent
Sign support structures			
General	Details of suppliers and evidence of structural conformity	1 week prior to engaging supplier	Superintendent
Attachment of signs	Details of proposed attachment systems	2 weeks prior to fabricating attachment systems	Superintendent
Footing reinforcement			
Steel reinforcement cages	Evidence of material conformity	1 week prior to fabrication	Superintendent
Off-site requirements			
Inspection	Notice of availability of sign structures for	2 working days	Superintendent

Clause/subclause	Requirement	Notice for inspection	Release by
	inspection		
Establishment			
Existing underground services	Locate services and protect against damage	1 week prior to erection	Superintendent
Location	Details of set-out	1 week prior to erection	Superintendent

Summary of WITNESS POINTS – On site activities

Clause/subclause	Requirement	Notice for inspection
Footing reinforcement		
Steel reinforcement cages	Splicing location and method	3 working days before splicing bars
Clearing		
General	Clear vegetation after set-out on advice from Council's Tree Preservation Officer	3 working days before clearing
Sign structure footings		
Excavation	Excavation as shown on drawings and as directed, including disposal of material	1 working day before next activity
Erection		
Sign damage	Repair or replace damaged signs	1 week before installing signs
Adjustment of existing signs and support structures		
General	Conform to Drawings and Superintendent direction	1 week before adjusting signs

2 PRE-CONSTRUCTION PLANNING

2.1 SCHEDULING

Program for works

Schedule: Signposts materials and on site locations.

Planning: Program the works to ensure adequate resources such as for control of traffic and locating existing underground services.

3 MATERIALS

3.1 STREET AND COMMUNITY FACILITY NAME SIGNS

Drawings

Information: Show the following information on drawings:

- Sign and legend selection and details.
- Support structures.
- Locations and mounting heights.

Standards

General: To AS 1742.5.

Signage system

Local authority requirements:

- Conform to Council's adopted signage system.
- Incorporate the Council's logo, as supplied by the Superintendent.

Proprietary sign requirements

Manufacture and installation: To the requirements of AS 1742.5 Street Name and Community Facility Name Signs, to the following details:

Approval

Submission: Submit details of the manufacturer for all sign materials and sign attachment systems prior to commencement of sign manufacture. This is a **HOLD POINT**.

3.2 REGULATORY, WARNING AND GUIDE SIGNS**Drawings**

Information: Show the following information on drawings:

- Sign and legend selection.
- Support structures of the following types:
 - . Standard round galvanised steel posts of size 50, 65 or 80 mm nominal bore, fitted with a cap for waterproofing.
 - . Purpose-designed steel structures as shown on the Drawings and manufactured to AS 4100.
- Anchor bolt assemblies.
- Locations and mounting heights.

Standards

Sign and legend dimensions and details: To AS 1743.

General

Supplier: Advise the names of the proposed suppliers of signs for the Superintendent's approval. Use suppliers who have previously established, or can now establish, their competence to carry out the work to conform with this worksection.

Proof of quality: Supply documentary evidence that all materials and parts proposed for use comply with the requirements of this worksection. This action is a **HOLD POINT**.

Temporary signs: Install temporary signs for the control of traffic nominated in *1101 Control of traffic*.

Sign blanks

Aluminium quality: Free of cracks, tears and other surface blemishes and the edges true and smooth.

Aluminium sheet alloy thickness of Sign blanks: 1.6 mm.

Type and temper: Type 5251 or Type 5052 and Temper H38 or Temper H36 to AS 1743.

The dimensions of the sign blank: ± 1.5 mm of the dimensions specified.

The finished sign: Flat within a maximum allowable bow of 0.5% of the maximum dimension of the sign blank in any direction.

One piece blanks: Provide one piece sign blanks if size permits otherwise, construct a multipiece sign.

Multipiece sign: Construct as follows:

- Minimise the number of sheets butted with 1 mm maximum gap at any point along the joint.
- Cover all joints by a backing strip of the same material and colour as used for the sign blank and with a minimum width of 50 mm over the full length of the joint.
- Fix the backing strip to each sheet with rivets, colour matched and at 200 mm maximum spacings.

Aluminium extrusion as backing strip: The aluminium extrusion used for mounting may be used as the backing strip for horizontal joints where it complies with the spacing requirements.

Face treatment: Chemically clean and etch or mechanically abrade the face of each sign blank. If the sign blank is to receive a paint background, spray paint the face with a compatible primer.

Back treatment: Uncoat the back of each sign blank and render the surface finish dull and non-reflective either by mechanical or chemical means and free of scratches and blemishes.

Mounting: Supply the signs with square holes or aluminium extrusion backing for mounting purposes, at the centre spacings as shown on the drawings.

Aluminium extrusion backing

Design section: Include the special aluminium extruded sections, as shown on the drawings, for mounting purposes.

Aluminium Type: 6063-T5 to AS/NZS 1866.

Fixing: Fix the aluminium extrusion at the centre spacings as shown on the drawings and fix to the sign blank with colour matched rivets at 200 mm maximum spacings.

Rivets

Type: Domed head and shank of aluminium alloy with a steel mandrel.

Colour matching: Paint head and shank with alkyd enamel over an etch primer prior to insertion.

Retro-reflective material for background and legend

Approval: Required for the material and compatibility, both in application and durability. This is a **HOLD POINT**.

Standard: To AS 1743 for Class 1, Class 2 and Class 2A materials. Unless shown otherwise on the Drawings, provide Class 2 material.

Application: Apply retroreflective material to the sign blank to conform with the manufacturers recommended methods so that it is completely adhered without bubbles, cracks or blemishes.

Non-reflective background material—Background paint

Paint system:

- Primer: One coat 2-pack epoxy.
- Finishing coats: Two coats 2-pack polyurethane (B20) or acrylic polyurethane (B44).
- Standard: To AS/NZS 2311 clause 5.2.

Application: Apply the paint using conventional air spray application to give a uniform cover free of blemishes. A minimum dry film thickness of 38 microns is required when tested to conform with AS 1580.108.2.

Colours: To AS 1743 from one of the following AS 2700 colours:

- Red: R13 Signal Red.
- Yellow: Y14 Golden Yellow.
- Brown: X65 Dark Brown.
- Blue: B11 Rich Blue.
- Standard Green: G12 Holly Green.
- Freeway Green: Emerald.

Background colours: From one of the following AS 2700 colours:

- White—Gloss.
- 'Dark' Green—Matt Colour No G61.
- 'Tourist' Brown—Matt Colour No X65.
- 'Dark Grey'—Matt Colour No N64.

Exact colorimetric values: To AS 2700.

Gloss levels:

- Matt coatings: Between 12 % - 15 % of gloss as determined by AS/NZS 1580.602.2, using an 85° head
- Gloss coatings: Between 85% - 95% of gloss as determined by AS/NZS 1580.602.2 using a 20° head.

Non-reflective background material—Background sheet material

Quality: Adhesive cast vinyl sheet material or other equivalent approved material can be provided in place of background paint. Provide material of uniform density compatible with the material provided for the legend, both in application and durability.

Colours and gloss: Provide uniform colours and gloss levels and conform to the requirements as above.

Application: Apply sheet material to the sign blank in accordance with the manufacturers recommended methods so that it is completely adhered without bubbles, cracks or blemishes.

Non-reflective material for legend—Legend screening ink

Quality: Provide high quality screening ink, full gloss, non-fade, non-bleed and scratch resistant type of ink compatible with the material to which it is applied. Provide screening ink with durability at least equal to the material to which the screening ink is applied.

Application: Apply screening ink legends to the background material in conformance with the manufacturers recommended methods.

Non-reflective material for legend—Legend sheet material

Quality: Adhesive cast vinyl sheet material or other equivalent approved material can be provided in place of screening ink. Provide material of uniform density and compatible with the material provided for the background both in application and durability.

Application: Apply sheet material legends to the background material in conformance with the manufacturers recommended methods so that it is completely adhered without bubbles, cracks or blemishes.

Non-reflective material for legend—Colours and finish

General: The requirements of **Regulatory, warning and guide signs** also apply to non-reflective materials for legends but additional colours complying with AS 2700 may be specified.

Reference markings

Identification code:

- Clearly and permanently stamp or engrave all warning, regulatory and guide signs with an identification coding. Do not damage the front face.
- Code cipher height: Between 6 and 10 mm.

Code location: At the rear face to the bottom left hand corner of rectangular signs and on or below the horizontal centre line to the left hand rear edge of other shaped signs.

Information required:

- Sign reference number.
- Manufacturer's Name.
- Month and Year of Manufacture.
- Manufacturer and Class of Retro-Reflective Material.

Proprietary signs: The requirements for reference markings do not apply to proprietary street name or community facility name signs.

Protection of signs

Protection: Protect the signs from damage during storage and transportation to site.

3.3 SIGN SUPPORT STRUCTURES**General**

Scope: Provide materials, fabrication of components and protective treatment of the sign support structures and anchor bolt assemblies, and the supply and fabrication of footing reinforcement cages.

Approved supplier: Provide the following for approval:

- Names of the proposed suppliers of sign support structures.
- Proof of competence: Suppliers who have previously established, or can now establish, their competence to carry out the work to conform with this worksection.
- Proof of quality: Supply documentary evidence that all materials and parts proposed for use conform with the requirements of this worksection.
- Fabrication details proposed. This is a **HOLD POINT**.

Structure details: Provide details of the sign support structures under the Contract on the drawings.

Fabrication

Standards: Fabricate purpose-designed steel structures from steel sections to AS 1163, AS 3678 and AS/NZS 3679.1.

Splices: Conform to the following:

- Restrict splices in members to a maximum of one splice per member.
- Provide splices of full penetration butt welds.

Welding to AS 1554.1: Category SP for sign structure welds and Category GP for anchor bolt assemblies.

Anchor bolts: Fabricate anchor bolt assemblies for purpose-designed structures.

Finish: Finish all steelwork free from pitting, sharp corners and projections and clean of mill scale, loose rust and foreign particles.

Preparation for galvanising: Provide the following:

- Chemical clean to AS 1627.1.

- Abrasive blast cleaning to AS 1627.4.
- Grade: Sa 2 ½ to AS 1627.9.

Protective treatment

Galvanizing:

- Prefinished: Standard galvanised steel posts.
- Hot dip galvanizing after fabrication: All steel components including brackets and anchor bolt assemblies as follows:
 - . Average minimum coating thickness of 85 microns and a bright finished surface free from white rust and stains, to AS/NZS 4680.
- Bolts and nuts: To AS 1214.

Splices in galvanized posts: Paint splices in standard galvanized steel posts by using an organic zinc-rich primer, or inorganic zinc silicate paint, in accordance with the repair requirements in Clause 8 of AS/NZS 4680.

Attachment of signs

Typical systems: Provide posts and other components with the required sign attachment holes or fittings to suit the typical attachment systems as shown on the drawings. Attach sign panels to each supporting member at each extrusion section or bolt hole in the sign panel.

Contractor's responsibility: Submit details of the proposed attachment systems for approval. This is a **HOLD POINT**.

3.4 FOOTING REINFORCEMENT

Steel reinforcement cages

Standards: To AS/NZS 4671.

Evidence of quality: Supply evidence that all materials conform with the requirements of this worksection. This is a **HOLD POINT**.

Cleanliness: Provide steel reinforcement free from loose or thick rust, grease, tar, paint, oil, mud, millscale, mortar or any other coating, but not to a smooth polished condition.

Accuracy: Bend reinforcement to the dimensions and shapes shown on the drawings. Do not permit heating of reinforcement for purposes of bending unless Grade 400 deformed bar reinforcement is specified.

Full bars: Furnish all reinforcement in the lengths indicated on the drawings. Splicing of bars will only be permitted with the approval of the Superintendent as to the location and method of splicing. This is a **WITNESS POINT**.

Splicing: Measure splicing in reinforcing fabric as the overlap between the outermost wire in each sheet of fabric transverse to the direction of splice, but not less than the pitch of the transverse wires plus 25 mm.

Welded splices and tack welding of bars: To AS 1554.

3.5 OFF-SITE REQUIREMENTS

Identification

Purpose-designed structure: Provide information as follows:

- Locations: The post column one metre above base plate, the outreach arm, and the sign support vertical fixing.
- Information shown:
 - . Sign reference number.
 - . Manufacturer's name.
 - . Month and year of manufacture.
 - . Drawing Number.

Marking: Legible, durable and applied by etching, stamping, engraving or welding.

Warranty: This marking is additional to date stamping required under **Sign structure warranty**.

Inspection

Pre-delivery Inspection: All purpose-designed structures covered by this worksection are subject to an inspection at the Contractor's Works prior to acceptance.

Notice: Notify the Superintendent of the availability of the sign structures for pre-storage or pre-delivery inspection. This is a **HOLD POINT**.

Inspection certificate

General: The Superintendent will issue the Contractor with a Certificate listing particulars of the items inspected.

The Certificate will indicate either:

- The sign structures satisfy the requirements of the worksection and are to be accepted; or
- The grounds for rejection of the goods.

Storage

Storage: Store the sign support structures and reinforcement cages until required to be incorporated into the Works or required by the Superintendent.

Store completed reinforcement cages under a waterproof shelter and supported above the surface of the ground, and protected from damage and from deterioration due to exposure.

4 EXECUTION

4.1 PROVISION FOR TRAFFIC

Minimise inconvenience

Minimise delay: Provide for traffic to conform with *1101 Control of traffic* while undertaking the work and organise the work to avoid or minimise delays and inconvenience to traffic, both vehicular and pedestrian.

Premature sign exposure

Secure sign: Where a sign is erected before it is intended for use by traffic and is visible to traffic, completely and securely wrap the face of the sign in porous cloth sheeting or other approved opaque covering material until the Superintendent directs that the sign is to be uncovered.

4.2 ESTABLISHMENT

Existing underground services

Services laid in proximity to the signs: Locate prior to placement of footings and erection of signs and protect services from damage. This is a **HOLD POINT**.

Location: DIAL 1100 BEFORE YOU DIG is a free service, from anywhere in Australia, for locating underground pipe and cables (possible within two working days). See www.dialbeforeyoudig.com.au.

Alignment

General: Comply with the following:

- Align signs approximately 5 degrees away from a right angle to the direction of traffic they are intended to serve.
- On curved alignments, determine the angle of placement by the course of approaching traffic rather than the orientation of the road at the point where the sign is located.

Location

General: Locate the signs as shown on the drawings or as directed by the Superintendent.

On site: Set out the work to ensure that all signs and support structures are placed as shown on the drawings or as directed by the Superintendent.

Submissions: Submit details of the set out and the proposed disposition and alignment of each sign support structure. This is a **HOLD POINT**.

4.3 CLEARING

General

Clearing vegetation: Following set out approval and advice from Council's Tree Preservation Officer clear and remove any trees and undergrowth within 3 m of the sign support structure and along a driver's line of sight to the front of the sign. This is a **WITNESS POINT**.

4.4 SIGN STRUCTURE FOOTINGS

Details

Construction: Construct the footings for a simple pipe support, or the footings for each post of a purpose-designed sign support structure, as shown on the drawings or as directed.

Excavation

Excavation and disposal: Neatly excavate footings to the depth and width shown on the drawings. Do not excavate by machine within 1 m of existing underground services. Dispose of the material from the excavation in an approved manner. This is a **WITNESS POINT**.

Anchor bolt assemblies

General:

- Accurately place and provide firm support.
- Provide anchor bolt assemblies with levelling nuts under the sign structure baseplates to allow adjustment of the structure after installation.
- Protect all exposed bolt threads from damage or adhesion of concrete during footing construction.

Steel reinforcement

General: Place steel reinforcement as shown on the drawings.

Concrete quality

Concrete in the footings of sign support structures: To *0319 Minor concrete works* and having a minimum compressive strength:

- 20 MPa at 28 days for pipe support footings.
- 32 MPa at 28 days for purpose-designed support footings.

Ready mixed concrete

Standard: If ready mixed concrete is used, mix and deliver to AS 1379.

4.5 ERECTION

Position and support

General: Accurately position and support all components during erection.

Top of post

Requirements: To conform with the following:

- Extend the top of each pipe support post beyond the upper extrusion section or bolt holes on the sign panels to enable attachment of the signs.
- Finish the top of each post below the top edge of the sign panel.
- Multi-post installations: Finish the tops of the posts at the same level except where sign shape or the arrangement of sign panels dictates otherwise.

Sign damage

Protection: During erection, support and brace sign panels and protect the sign face from damage.

Repair: Repair signs damaged during erection to a standard equivalent to the original sign or replaced by the Contractor at the Contractor's cost. This is a **WITNESS POINT**.

Treatment of damaged areas

Protective treatment: To conform with the following:

- Scratched and slightly damaged areas not exceeding 2500 mm² on any one structure: Repair with an organic zinc-rich primer, or inorganic zinc silicate paint, to the repair requirements of AS/NZS 4680.
- Totally-damaged coating areas exceeding 2500 mm²: Regalvanize.

Costs: Borne by the Contractor.

4.6 ADJUSTMENT OF EXISTING SIGNS AND SUPPORT STRUCTURES

General

Adjustment of existing signs: Where shown on the drawings and where directed by the Superintendent, adjust existing sign panels and sign support structures. This is a **WITNESS POINT**.

Scope:

- Minor adjustments of sign panels and/or sign support structures.

- Dismantling of signs and sign support structures
- Relocation or replacement of sign support structures including footings and re-erection of signs.

4.7 SIGN STRUCTURE WARRANTY

General

Scope: Supply of any structure under this worksection.

Warranty period: 12 months following the date of dispatch from the Contractor's Works to the Site.

Failed or defective structures: Obligations:

- Remove any sign structure which has failed in service or found defective within 12 months of the date of dispatch.
- Make good the defect or arrange to have the defect made good, and subsequently return and re-erect the good unit at the original location at no charge to the Principal.
- Unless otherwise agreed, process and return defective structures within 30 calendar days from the date the Contractor is notified by the Principal of the defect.

Warranty exclusion: Any structure which has failed as a result of a traffic accident, abuse or act of vandalism caused by a third party after delivery to the site is not covered by warranty provisions.

Date of dispatch mark: In order to facilitate checking of warranty claims, legibly stamp, etch or engrave the date of dispatch from the Contractor's Works to the Site on all separate items of the sign structure.

Application: This warranty to apply notwithstanding any defects liability period provided for in the General Conditions of Contract.

4.8 LIMITS AND TOLERANCES

Application

Summary: The limits and tolerances applicable to this worksection are summarised in **Summary of limits and tolerances table**.

Summary of limits and tolerances table

Activity	Limits/Tolerances	Worksection Clause Reference
Sign blank		
-Dimensions	± 1.50 mm of specified dimensions	Regulatory, warning and guide signs
-Bow	< 0.5% of maximum dimension	Regulatory, warning and guide signs
-Butt gap in multipiece sign	< 1 mm	Regulatory, warning and guide signs
-Rivet spacing in backing strip	< 200 mm	Regulatory, warning and guide signs
-Backing strip width	> 50 mm	Regulatory, warning and guide signs
Extrusion Backing		
-Rivet Spacing	< 200 mm	Regulatory, warning and guide signs
Background Paint		
-For matt coatings, gloss level	Between 12% - 15%	Regulatory, warning and guide signs
-For gloss coatings, gloss level	Between 85% - 95%	Regulatory, warning and guide signs
Reference marking		
-Height of Coding	Between 6 mm - 10 mm	Reference markings
Sign Support Structures		
-Protective Treatment thickness	> 85 microns	Sign structures and anchor bolt assemblies

Activity	Limits/Tolerances	Worksection Clause Reference
-Paint coating over Splices in standard galvanised posts	> 100 microns	Sign structures and anchor bolt assemblies
-Damaged surface of galvanised surfaces:		
. Coating with zinc rich paint	Area < 2500 mm ²	Erection
. Regalvanise	Area > 2500 mm ²	Erection
Clearing		
-Trees and Undergrowth to be cleared	< 3 m from sign support structure	Clearing
Concrete in footings of sign support structures		
-Strength		Sign structure footings
. Pipe support footings	20 MPa at 28 days	Sign structure footings
. Purpose-designed support footings	32 MPa at 28 days	

5 MEASUREMENT AND PAYMENT

In accordance with the schedule of rates

1415 WEED CONTROL

1 GENERAL

ACTIVITY DEFINITION (What work is included?)

This activity covers the spraying of herbicide or related treatment such as hand weeding and hot water or direct chemical application to provide a weed free surface area to parks and recreation areas, gardens, around park/area furniture and along boundary fences for which the Council is responsible.

Spraying of herbicides shall only be undertaken with the prior approval of the Superintendent.

PERFORMANCE DISTRESS AND DEFECTS (What do we look for?)

Areas of weed infestation.

PERFORMANCE CRITERIA (Why do we do it?)

Boundary fences are treated to prevent infestation to adjoining private property. Pathways and other concrete jointing are treated to minimise spalling and improve appearance. Weed treatment is undertaken to ensure the provision of high quality grassed areas for active and passive recreation uses.

2 REQUIREMENTS

PERFORMANCE STANDARDS (What is required?)

Garden areas and lawn areas are to have controlled and minimal weed infestation. Chemical spraying and direct chemical application shall meet with requirements of the Environmental Protection Authority and shall be undertaken to manufacturer's instructions. All spray operators undertaking chemical spraying shall hold licences issued by the appropriate Statutory Authorities.

3 WORK METHOD

All herbicides will be supplied by the Principal

Remove weeds and unwanted plants by hand intact with root system and dispose by a method approved by the Superintendent. Approval to submitted Work Plan is required prior to commencement of any weed spraying or direct chemical application activities.

Mechanical weed removal or treatment is to be used only with approval of Superintendent.

Check that alternative weed control measures have been fully considered before proceeding with chemical treatment.

Ensure appropriate licences or permits are obtained to cover herbicide utilisation if required by law.

Provide evidence of compliance to Occupational Health and Safety and Workcover requirements. Train all personnel in the correct procedures and safety requirements including safety clothing and safety apparatus training.

Ensure Material Safety Data Sheets, which detail the active chemical when spraying or applying chemicals, are available for operator. They shall include manufacturer's safe recommended spray/ application rates.

Identify regeneration areas and avoid inadvertent treatment.

Avoid disturbance to desirable native vegetation and the application of chemicals on native vegetation.

Minimise spray drift and any runoff that may affect watercourses.

Terminate spraying in wet or windy conditions.

Spraying shall not occur while the general public are in the vicinity

Maintain all equipment in good working condition.
Display HAZCHEM code on equipment and storage containers.
Hold records of chemical applied, location and date of spraying.

1416 PLANTING ANNUALS

1 GENERAL**ACTIVITY DEFINITION (What work is included?)**

This activity includes the removal of spent annual plants, preparation of beds and planting out and watering of new annuals in garden areas provided in Councils' parks and recreation areas.

Annual plants and trees will be supplied by the Principal.

PERFORMANCE CRITERIA (Why do we do it?)

Planting of annuals is required to keep the garden areas visually attractive in accordance with the intended landscape character.

2 REQUIREMENTS**PERFORMANCE STANDARDS (What is required?)**

Gardens are to have spent annual plants removed, new beds prepared and be replanted with new plants as supplied.

3 WORK METHOD

Mark out the site for the garden bed.

Demolish any built items required to be removed according to 0201 DEMOLITION

Prior to excavation and after demolition, supply and apply the specified herbicide (e.g. Roundup Biactive®) and wetting agent where required to control weeds and kill any unwanted vegetation.

Prune existing shrubs that are on or overhanging the site as necessary to create the garden bed.

Excavate the site to a depth of at least 200 mm. Where rock is encountered advise the Superintendent. The Superintendent may reduce the depth or order excavation through rock at the applicable rate. Dispose of the excavated material according to the Waste Management Plan

Supply and spread the soil mix specified in Table 1 – GARDEN COMPOST SOIL MIX and progressively tamp the soil to a depth of approximately 200 mm. Thoroughly water the spread soil to prevent voids. Lightly rake over the surface to achieve the required level.

Where the garden bed is an existing bed prepare the bed by removing weeds by hand and loosening the soil to a depth of 150 mm.

Table 1 – Garden Compost Soil Mix

Composition % by Mass	Test Method	Proportion
<i>Black Soil</i>		50%
<i>Coarse Sand</i>		20%
<i>Composted Organic Matter such as manure, sawdust, pine bark, organics, spent coffee grounds, spent mushroom compost, etc.</i>	AS1289.D1.1	30%
<i>Salt Content</i>	AS1871.5	under 0.1%
<i>Reaction</i>	AS1289.D3.1	
<i>PH Range</i>		5.5 to 7

Prepare and Install Plants

The areas for planting includes road islands, median strips, roundabouts, verges, garden beds, parks and other specified areas.

Prior to commencement of planting, thoroughly water all plants in their containers and areas to be planted. Keep in a moist state throughout planting.

For soft vegetation, loosen the garden bed to be planted to a depth of 200 mm. Remove stones and debris that might damage the roots or be unsightly.

Mark out the location for the plants in the specified layout to suite type and habit of the plant. Adjust to avoid service lines or to avoid soil/rock where necessary. For soft vegetation adopt a spacing of 4 to 9 plants per square metre as recommended for the plant or as otherwise specified.

Excavate the hole to the following size as appropriate for the plant:

- (a) For small plants to the depth of the roots.
- (b) For tubestock to the depth of the roots.
- (c) For plants, a depth and a width twice that of the rootball.
- (d) For Shrubs, a depth equal to the rootball plus 100 mm and a width twice that of the rootball. Slope the sides away from the hole.
- (e) For trees, to the depth of the rootball and a width that is at least twice the diameter of the rootball at the base. Slope the sides away from the hole.

Remove loose rocks and debris from the hole.

Into the hole prepared for planting, apply fertiliser of the type previously agreed by the Superintendent. Just prior to planting, fill the hole with water and allow to drain away.

Install each plant at the required spacing. Install at least two hardwood stakes (30x38x1800 mm) and figure eight ties of hessian webbing to support each tree of 35 L or more.

Supply and Spread mulch around the plants

Water the plantings at the time of planting and provide a final watering at the time of completion of the work.

Return empty plant containers that are intact to the Superintendent for re-use.

1418 GARDENS/LANDSCAPE MAINTENANCE

1 GENERAL**ACTIVITY DEFINITION (What work is included?)**

This activity includes the inspection and maintenance of gardens, excluding annual plants, in areas provided in Councils' parks and recreation areas and roadsides.

PERFORMANCE DISTRESS AND DEFECTS (What do we look for?)

The presence of damaged and dead plants, weeds, pests and rubbish.

PERFORMANCE CRITERIA (Why do we do it?)

Garden maintenance is required to keep the areas visually attractive in accordance with the intended landscape character and to promote an optimal growth condition of the garden.

2 REQUIREMENTS**PERFORMANCE STANDARDS (What is required?)**

Gardens are to have weeds, rubbish and damaged or dead plants removed.

Pest and disease control measures are to be applied where necessary.

3 WORK METHOD***Garden Beds Maintenance (Parks, Cemetery and General Gardens)***

Weeds, rubbish and damaged or dead plants are to be removed by hand and disposed of at a site approved by the Superintendent.

Upon application by Contractor, replacement plants as supplied by Council shall be planted to replace dead stock.

Water all garden areas to maintain healthy plant stock.

Mulch to a depth of 50–100 mm averaging 75 mm.

Spray shrubs, trees and plants to control insect pests and/or fungus, where approved by the Superintendent.

Adjacent paved areas are to be swept clean upon completion of garden activities.

The Contractor shall have an operation in place for the delivery, to recycling centres, of all collected material suitable for recycling.

All vegetable matter removed from gardens shall be delivered to Council's Green Waste Processing Centre or other Centre approved by the Superintendent.

All other collected debris shall be removed and disposed of at a legal tipping facility.

SPECIAL REQUIREMENTS:

Where spraying to control weeds and/or insect pests is approved by the Superintendent, it shall be carried out under worksection 1415 Weed control, as appropriate.

Garden Bed Maintenance (Roadside)

Prior to commencement a traffic control plan must be submitted and approved by the superintendent

Weeds, rubbish and damaged or dead plants are to be removed by hand and disposed of at a site approved by the Superintendent.

Upon application by Contractor, replacement plants as supplied by Council shall be planted to replace dead stock.

Water all garden areas to maintain healthy plant stock.

Mulch to a depth of 50–100 mm averaging 75 mm.

Spray shrubs, trees and plants to control insect pests and/or fungus, where approved by the Superintendent.

Adjacent paved areas are to be swept clean upon completion of garden activities.

The Contractor shall have an operation in place for the delivery, to recycling centres, of all collected material suitable for recycling.

All vegetable matter removed from gardens shall be delivered to Council's Green Waste Processing Centre or other Centre approved by the Superintendent.

All other collected debris shall be removed and disposed of at a legal tipping facility.

SPECIAL REQUIREMENTS:

Where spraying to control weeds and/or insect pests is approved by the Superintendent, it shall be carried out under worksection 1415 Weed control, as appropriate.

1419 CARE OF GRASS AND TURF

1 GENERAL

1.1 REFERENCED DOCUMENT

The following documents are incorporated into this worksection by reference:

Standards

AS 4419-2003 Soils for landscaping and garden use

ACTIVITY DEFINITION (What work is included?)

This activity covers the watering, fertilising, soil aeration, thatch removal and top-dressing of parks and recreation areas.

Aeration

Topdressing

PERFORMANCE CRITERIA (Why do we do it?)

Grass and turf are cared for to maintain the parks and recreation areas in good condition and appearance and suitable for the appropriate sporting/recreational activities by park users.

2 REQUIREMENTS

PERFORMANCE STANDARDS (What is required?)

The grass and turf surfaces are to be inspected and remedial treatment provided as appropriate. Treatment may be for:

Aeration — 250-400mm deep

Topdressing — 20mm thick

3 WORK METHOD

Aeration

Remove up to 2 m³ of litter per hectare as part of undertaking the specified treatment and dispose of according to the Waste Management Plan (refer to Clause G.2.08 WASTE MANAGEMENT).

Advise the Superintendent when excessive litter or "dumped refuse" exceeds the limit.

Do not undertake the Work when the ground may be damaged by the equipment (e.g. soft after rain, etc) or when excessive dust may be generated (e.g. application of topdressing or fertiliser).

Avoid undue compaction of the existing soil or damage to the turf. Minimise vehicular traffic onto and across areas that are not roadways.

Aerate the specified turf area and include a 3 m strip around the marked perimeter of any sportsfields. The method used shall relieve compaction of the soil layer, improve water infiltration, improve turf growth and appearance

Aerate the turf to a depth of 250 to 400 mm below the soil line and spaced between 100 to 200 mm apart

Minimise traffic onto and across the turfed area. Areas compacted by the Contractor will be redone.

The Contractor is to confirm that services and sprinkler heads are marked and are visible before commencement of works

Topdressing

The Work involves applying, working and rubbing into the surface a topdressing materials determined by the Principal.

Apply the topdressing material evenly over the entire surface using appropriate machinery and in accordance with the spread rate. Spread to an even depth (about 20 mm) without undue compaction to existing soil.

Ensure that the topdressing material applied is worked into the grass sward on the same day as delivery.

The proportions and constituents of topdressing sand, topdressing soil, and soil amendment or conditioner materials to promote turf health will be determined by the Superintendent based on soil testing of the specified area and a visual inspection.

Depending on requirements for the turf, the Works will include supply of materials by the Contractor in accordance with AS 4419 SOILS FOR GARDENS AND LANDSCAPE USE. The topsoil materials shall be free of weed seeds, roots of perennial weeds, sticks, subsoil and foreign matter.

Topdressing materials shall be screened and will include the materials as specified:

Sand: Washed Sand

Sand/Soil blend: 50:50 Blend

Sand/Soil/Organic Blend: 50:40:10

The contractor must rectify any damage to irrigation that is caused by the topdressing work

The contractor must also carry out rectification work to the playing surface that is damaged due to the weight of the topdressing machine

Upon completion the contractor must clean and make good the area where the topdressing material was stockpiled.

1420 GRASS MOWING

4 GENERAL

4.1 REFERENCED DOCUMENT

The following documents are incorporated into this worksection by reference:

Standards

AS 2657-1985	Powered rotary lawnmowers
AS 3792	Ride-on lawnmowers
AS 3792.1-1990	Field guides for traffic control
AS 4057-1992	Powered walk-behind and hand-held lawn trimmers and lawn edge trimmers - Mechanical safety requirements and test methods
AS 1742: Various	Manual of uniform traffic control devices
AS 1742.3: 2009	Traffic control for works on roads
SAA HB 81: Various	Field guides for traffic control

ACTIVITY DEFINITION (What work is included?)

This activity covers mowing of all classifications of parks and recreation areas and those areas classified by Council as 'grassed areas'.

This activity includes edge trimming along footpath edges, around trees, shrubs, access chambers, hydrants, posts, poles, under and around seats and tables.

This activity covers slashing or mowing of roadside, shoulders, verges or median growth and those areas classified by Council as 'grassed areas' and included information provided as part of the contract documents.

This activity includes edge trimming where specified including around trees, shrubs, inspection lids, hydrants, posts, poles, under and around seats and tables.

Medians are defined as grassed areas between lanes or carriageways.

Verges are defined as:

In rural areas—strips of grassed area between the edge of formation and the start of batter (typically 1.5–2.0 metres wide).

In urban areas—strips of grassed area of road reserve not covered by carriageway or footpath

Shoulders are those areas between the edge of seal and the guideposts or kerb.

PERFORMANCE DISTRESS AND DEFECTS (What do we look for?)

Grass growth impeding safe sight distances or obstructing surface drainage.

Grass growth impeding safe and intended usage of parks and recreation areas and creating an unsightly appearance to parks/area users.

PERFORMANCE CRITERIA (Why do we do it?)

Verges, medians and roadside areas are slashed or mowed to provide adequate sight distance for road users, effective cross drainage, a neat appearance to the road asset and the prevention of bushfires.

Grass mowing creates a neat appearance to the parks and recreation areas and allows for safe usage.

5 MOWING REQUIREMENTS

PERFORMANCE STANDARDS (What is required?)

Grassed areas are to be maintained at the following target growth limits.

Pocket Parks	< 40 mm	Linear Parks	< 60 mm
Local Parks	< 40 mm	Regional Parks/Recreation Areas	< 60 mm
District Parks	< 40 mm	Sportsgrounds	< 40 mm
Urban Medians and Verges	< 75 mm	Rural Medians	< 75 mm
Urban Roadside	< 120 mm	Rural Roadside and Verges	< 250 mm

The height of grass after cutting is to be no less than 25 mm and no greater than 40 mm.

6 WORK METHOD

Open Space

Equipment will be maintained and operated so as to minimise the danger of projecting stones or debris in a dangerous fashion. Grass and other debris shall not be projected into open surface drains, grates or culverts.

The operators shall be fully trained in the safety requirements contained in:

AS 2657	<i>Powered rotary lawnmowers</i>
AS 3792.1	<i>Ride-on lawnmowers</i>
AS 4057	<i>Powered walk-behind and hand-held lawn trimmers and lawn edge trimmers – Mechanical safety requirements & test methods.</i>

The operator(s) shall be fully trained to carry out the works specified and briefed on requirements necessary to avoid damage to natural regeneration of native vegetation or landscaped areas as indicated at the commencement of the contract and from time to time during the contract period.

Hand mowing and/or trimming shall be undertaken along footpath edges, around trees, shrubs, access chambers, hydrants, posts, poles and around seats and tables.

Mowing shall cease during periods of Total Fire Ban where areas are open to dry grass or bushland with high fuel load. Council approval for mowing during Fire Bans is required in all areas which are not regularly watered and protected by perimeter walkways or gardens that act as firebreaks.

Mulching mowers shall only be used at locations approved by the Superintendent.

Road Reserve

Before execution of any mowing operations within the road reserve a traffic management plan shall be submitted to the superintendent representative for approval. appropriate signs Once approved the plan is required to be implemented.

Equipment will be maintained and operated so as to minimise the danger of initiating a fire or projecting stones or debris in a dangerous fashion. Grass and other debris shall not be projected onto the road surface or into open surface drains, grates or culverts.

The operator(s) shall be fully trained to carry out the works specified and briefed on requirements necessary to avoid damage to natural regeneration of native vegetation or landscaped areas as indicated at the commencement of contract and from time to time during the contract period.

Hand mowing and/or trimming shall be undertaken adjacent to structures, signs, guardfence, walls, poles and roadside furniture, etc.

Mowing shall cease during periods of Total Fire Ban.

Where shown in the schedule, grass cuttings are to be disposed of responsibly and legally.

Mulching mowers shall only be used at locations approved by the Superintendent.

RCC01 TREE PRUNING AND/OR REMOVAL, PLANTING AND MAINTENANCE

1 CATEGORISATION OF TREES

Table 1 – Categorisation of Trees

Tree Category	Dimensions
Small tree	<ul style="list-style-type: none"> ▪ Height up to 6 metres <p>AND/OR</p> <ul style="list-style-type: none"> ▪ Canopy width up to 4 metres
Medium tree	<ul style="list-style-type: none"> ▪ Height between 6-15 metres <p>AND/OR</p> <ul style="list-style-type: none"> ▪ Canopy width between 4-12 metres
Large tree	<ul style="list-style-type: none"> ▪ Height greater than 15 metres <p>AND/OR</p> <ul style="list-style-type: none"> ▪ Canopy width greater than 12 metres

2 TREE PRUNING

The Contractor shall ensure that all contract personnel are fully conversant with the work they are required to perform under this Specification and that they are competent and appropriately trained to carry out the works specified.

At least one member of each tree trimming crew shall have successfully completed the TAFE 'Tree Care for Electricity Workers' course conducted by the Ryde School of Horticulture or a course that Council's Superintendent or his representatives considers is equivalent.

Only 'accredited persons' shall undertake tree removal/pruning works to achieve required clearances from live electrical conductors and overhead power lines. 'Ordinary persons', their plant, tools, other equipment and materials shall not carry out tree removal/pruning works within three (3) metres of power lines or conductors.

Accredited persons and ordinary persons are as defined in Chapter 1 – Clause 1.9 of the WorkCover Tree Work Code of Practice 2007.

At least one member of each tree trimming crew shall possess a current industry recognised first aid certificate.

The Superintendent will identify the tree/s that shall be pruned and advise of the nature and extent of the work.

All tree pruning works shall consist of ALL the following operations (wherever applicable) and shall be known as composite pruning:

- i) The trimming of Council trees away from power lines, aerial bundled conductors (ABC), domestic service wires, street lanterns, power poles and stay wires to the vegetation trimming clearances specified by EnergyAustralia, under both normal and adverse weather conditions

- ii) The trimming of Council trees to raise the canopies (crowns) to a height of two-and-a-half metres wherever possible, including the removal of all lateral branches and sucker growth below this height
- iii) The trimming of branches on Council trees away from road and speed signs as required to ensure sign visibility
- iv) The trimming of branches on Council trees which are overhanging private property, as nominated by Council's Superintendent or his representatives
- v) The removal of all deadwood above 30mm in diameter from Council trees
- vi) The chipping and disposal of all branches and foliage removed during tree trimming operations.

All work shall be carried out in accordance with AS 4373 – 2007 – *Pruning of Amenity Trees* and WorkCover Tree Work Code of Practice 2007.

The Contractor shall plan and carry out the pruning of all tree/s so that there is no damage to persons, property, utility services (aerial or below ground) or to nearby vegetation.

3 TREE PRUNING COMPLETION

All works are to be completed as per instructions within twenty-one (21) days of receipt of a Work Order and/or Purchase Order from Council's Superintendent or his representatives.

Failure to complete the work within the specified timeframe, other than for reason of weather preventing such work to be undertaken, may result in the Contractor being in breach of the contract.

4 TREE REMOVAL

Tree removal shall include the removal of the entire tree to ground level, stump grinding to a minimum depth of 300mm, chipping of all cut material, raking over and levelling off of the entire area and the disposal of all debris from the tree site area.

At the completion of each tree removal/stump grinding operation the contractor shall provide Council's Superintendent or his representatives with a digital photograph of the completed work, clearly indicating that the work has been completed and that it complies with the relevant Specification.

All such completion photographs shall be captioned with the location of the tree, the relevant Work Order number and the date the works were completed. No invoices for tree removal/stump grinding works will be paid unless completion photographs for all jobs on any such invoice have been provided to Council's Superintendent or his representatives.

All work shall be carried out in accordance with AS 4373 – 2007 – *Pruning of Amenity Trees* and WorkCover Tree Work Code of Practice 2007.

The Contractor shall plan and carry out the removal of the tree/s so that there is no damage to persons, property, utility services (aerial or below ground) or to nearby vegetation.

Prior to the commencement of any tree removal/stump grinding activities, it is strongly recommended that contractors undertake a search for underground services. Information on locating underground pipes, cables and other services can be obtained by telephoning Dial Before You Dig on 1100 or by logging onto www.dialbeforeyoudig.com.au

5 TREE REMOVAL COMPLETION

All works are to be completed as per instructions within twenty-one (21) days of receipt of a Work Order and/or Purchase Order from Council's Superintendent or his representatives.

Failure to complete the work within the specified timeframe, other than for reason of weather preventing such work to be undertaken, may result in the Contractor being in breach of the contract.

6 STUMP REMOVAL

Prior to the commencement of any tree removal/stump grinding activities, it is strongly recommended that contractors undertake a search for underground services. Information on locating underground pipes, cables and other services can be obtained by telephoning Dial Before You Dig on 1100 or by logging onto www.dialbeforeyoudig.com.au

Stump removal involves the removal of the entire stump and the grinding of surrounding tree roots to a depth of at least 300mm below ground level using the appropriate 'stump grinding' technique.

All tree roots emanating from the base of any tree stump that is to be removed, or which are protruding above the height of the surrounding nature strip/footpath area, are to be removed and/or stump ground as necessary to allow the entire area to be left flush with the nature strip/footpath.

Any soil mounding that has been caused by tree root growth is to be ground and the area left flush with the surrounding nature strip/footpath once the subject stump has been removed.

On completion of stump grinding, the grindings shall be swept up and removed and the site left in a clean and tidy condition flush with the surrounding area.

At the completion of each stump grinding operation the contractor shall provide Council's Superintendent or his representatives with a digital photograph of the completed work, clearly indicating that the work has been completed and that it complies with the relevant Specification.

All such completion photographs shall be captioned with the location of the tree, the relevant Work Order number and the date the works were completed. No invoices for tree removal/stump grinding works will be paid unless completion photographs for all jobs on any such invoice have been provided to Council's Superintendent or his representatives.

7 STUMP REMOVAL COMPLETION

All works are to be completed as per instructions within twenty-one (21) days of receipt of a Work Order and/or Purchase Order from Council's Superintendent or his representatives.

Failure to complete the work within the specified timeframe, other than for reason of weather preventing such work to be undertaken, may result in the Contractor being in breach of the contract.

8 PREPARE AND INSTALL PLANTS

Prior to the commencement of any excavation or tree planting activities, it is strongly recommended that planting contractors undertake a search for underground services. Information on locating underground pipes, cables and other services can be obtained by telephoning Dial Before You Dig on 1100 or by logging onto www.dialbeforeyoudig.com.au

This planting procedure applies specifically to the planting of 25-litre plant stock only and should be appropriately modified if planting larger stock.

- (a) Excavate a hole at least as wide and deep as the plant container size. Break up the base and sides of the hole a further 150mm with, for example, a shovel, pick, mattock or crowbar;

NOTE: Excavation is measured in other than rock. It is not intended that rock be excavated to plant trees. If rock is encountered, an alternative planting site should be sought.

- (b) Remove plant from container, slightly tease the root ball and then place plant into hole. Top of root ball should be planted level with surrounding soil;
- (c) Backfill the hole, lightly firming down in 150mm layers. Soil mix shall be:
- i) 80% site soil, and
 - ii) 20% approved soil mix (incl. fertiliser, wetting agent) supplied by the Superintendent.

9 INCORPORATE FERTILISER, WETTING AGENT AND SOIL MIX

As part of the planting process, apply fertiliser, wetting agent and approved soil mix at the rate nominated by the Superintendent. Tamp down the surrounding soil to secure the plant in position.

10 STAKING OF PLANTS

Stake trees using 2 x 50mm x 50mm x 1500mm hardwood stakes and a figure eight tie of 50mm wide nylon or hessian tie stapled to the stakes.

11 MULCHING

Spread mulch over the soil surrounding the tree to a diameter of 500mm all around the tree trunk and to a depth of 75mm. Do not heap mulch around the trunk and ensure that it is 'dished' around the base of the tree.

12 WATERING

Water in well after planting using at least 10 litres of water for each tree and provide a final watering at completion of works.

13 FORMATIVE PRUNING

All trees shall be formatively pruned at the time of planting to ensure that all sucker growth is removed and that trees have one central leader only. Trees should be underpruned to the extent that the canopy constitutes one third only of the tree's total height.

At the completion of each tree planting operation or project the Contractor shall email Council's Superintendent or his representatives a digital photograph of each planting which clearly indicates the work has been completed and complies with the relevant Specification.

All such completion photographs shall be captioned with the location of the tree/s, the relevant Work Order number and the date the works were completed. No invoices for tree planting works will be paid unless completion photographs for all jobs on any particular invoice have been provided to Council's Superintendent or his representatives.

14 INSTALLATION COMPLETION

All works are to be completed as per instructions within twenty-one (21) days of receipt of a Work Order and/or Purchase Order from Council's Superintendent or his representatives.

Failure to complete the work within the specified timeframe, other than for reason of weather preventing such work to be undertaken, may result in the Contractor being in breach of the contract.

15 MAINTENANCE

Maintenance and watering of all planted trees and shrubs is to continue for a period of six (6) months from the completion of planting. All trees are to be regularly watered and each tree shall receive an amount of water that will ensure healthy, vigorous growth – at least ten (10) litres of water per tree per watering episode.

The Contractor shall ensure that they undertake the weeding, adjustment and/or replacement of stakes and ties, minor pruning work and re-instatement of mulch as required during the maintenance period.

The Contractor shall provide the Superintendent or his representatives with a monthly maintenance report/checklist which clearly verifies that the above maintenance regime is being adhered to.

RCC02 CLEANING INFRASTRUCTURE AND WASTE DISPOSAL

1 GENERAL

The Contractor shall also comply with the other technical requirements in the TECHNICAL SPECIFICATION – GENERAL. This includes:

- (a) Carry out the Works in accordance with Site Management
- (b) Implement effective measures for erosion and sediment control and waste management in accordance with specification part 1102
- (c) Develop and implement effective traffic control in accordance with specification part 1101

The Contractor shall undertake all work using 'Best Practice' for the particular work. They must exercise the standard of skill, care and diligence expected of a competent professional and/or tradesperson, experienced in the types of service associated with the Works.

The contractor must provide a Works Program consistent with the quantity of work. Present the program in a logical format and include the following:

- (a) planned start and end dates.
- (b) sequence and duration of the major activities.
- (c) starting and completion times and identify critical milestones.
- (d) the team, plant and equipment to be used on site.
- (e) any requirements from the Principal or Superintendent

Provide the Superintendent with the contact details for the Contractor's representative, which shall include a mobile phone, whenever work is conducted on site.

The Contractor shall make due allowance for obstacles and restrictions on most sites.

The Contractor shall not block access for emergency vehicles

The Contractor shall make due allowance in the rates for interruptions to the work by members of the public. Questions that are beyond describing the nature of the work shall be politely referred to the Superintendent.

Immediately notify the Superintendent of any contentious issue that may disrupt the Work and where possible undertake work in another area until the issue is resolved by the Superintendent.

Complete and submit the following reports within 14 days of completing each days work:

- (a) a Daily Reporting Sheet.
- (b) relevant schedules or tick-sheets that verify the work and times.
- (c) other sheets as required for particular types of work.

The Contractor's personnel at the site shall have the knowledge to undertake the required activities in the Specification.

The Superintendent reserves the right to test the Contractor's personnel on their knowledge.

Materials

The Principal will supply certain materials free of charge for use in the work and where specified.

The contractor shall notify the Superintendent of the required quantity of Principal supplied material at least 5 days before requiring the material.

The Superintendent will advise the Contractor when the materials are available and where the materials are to be collected from. The Contractor will be given assistance with loading the supplied materials.

Such materials shall not be used for any other than their intended purpose.

The Contractor shall supply all other materials required for the Works.

The Contractor shall obtain the Materials Safety Data Sheets (MSDS) and prepare safe working procedures in accordance with OH&S requirements.

The Contractor is responsible for care and storage all the materials.

2 CLEANING INFRASTRUCTURE

The work to be executed under this clause includes the following:

- (a) removal of graffiti and bill posters.
- (b) masking graffiti using paint.
- (c) applying anti-graffiti treatment.
- (d) cleaning of signs.
- (e) cleaning external paved areas.
- (f) cleaning stormwater drainage lines.

The contractor shall:

1. Ensure that the cleaning method (e.g. pressure, temperature, detergents, solvents, etc):
 - (a) does not cause damage to the surface.
 - (b) does not cause a nuisance or hazard to persons or property.
2. Notify and consult with the Superintendent when changed procedures or materials are proposed.
3. Use all materials in accordance with the manufacturer's recommendations.
4. Where proposed, standpipes shall be Approved Metered Standpipes with a current permit for use on Sydney Water Corporation Hydrants.
5. Provide appropriate signage to adequately warn the public of the use of chemicals or other agents for the work.

3 REMOVAL OF GRAFFITI AND BILL POSTERS

- .1 Commence the work within 2 days of the Superintendent placing the order.
- .2 Locations specified by the Superintendent may be at varying heights and include the following:
 - (a) building exteriors and walls (e.g. Council and non-Council owned).
 - (b) public authority and service supply company assets (telecommunications, water, gas and electricity).
 - (c) traffic signal hardware.
 - (d) roadside furniture.
 - (e) permanent Signs (e.g. statutory, regulatory, directional, warning, advisory, parking, name signs, etc).
 - (f) fences (e.g. road, boundary, park, etc).
 - (g) street and park furniture (seats, ornamental lighting poles, outdoor artworks, etc).
 - (h) play equipment (adventure equipment, swings, slides, etc).

- .3 Where removal is from a non-council asset or requires access across private property the Superintendent will provide a written consent to enter the property.

Where directed by the Superintendent, obtain from the owner or the authorised agent written consent to enter the property and where applicable, remove graffiti or bill posters at no charge to the owner or tenant.

Where the owner is unavailable, leave a standard letter with the Contractor's contact details, details of the graffiti found at the property and a copy of the consent to be signed.

If after 5 days there is no contact made by the owner or agent, notify the Superintendent, who will be responsible for obtaining written consent.

Do not enter property until written consent is obtained.

- .4 Commence the removal work within 2 days from receipt of the owner's or the agent's written consent.
- .5 Removal will involve either of the following:
 - (a) Where cleaning has been specified, remove graffiti or bill posters by cleaning.
 - The extent of cleaning is a rectangular area that wholly contains the graffiti plus 300 mm all around. Cleaning shall not spread the residue beyond the rectangle.
 - (b) Where masking of graffiti has been specified:
 - The extent of painting is as specified by the Superintendent. As a general guide only painted surfaces will be repainted: walls painted to the nearest edge, affected surface of door completely repainted, complete item repainted if the surface area is less than 1 m².
 - Match the type of paint (oil based or water based) and the colour, finish and texture of the existing painted or varnished surface. Supply and use only exterior grade paint products.
 - Prepare the surface and apply the paint coating

- .6 Take all necessary steps to protect the work and the surrounds to the work during graffiti removal. The Contractor is responsible for rectifying any and all damage or disfigurement to any property arising directly or indirectly from the removal Works.
- .7 Do not use cleaning techniques that may damage the surface (e.g. high pressure cleaning on porous surfaces).

- .8 The Contractor shall maintain records of work that include the following:
- (a) "Works Completed" schedule as provided by the Superintendent:
 - details of Works performed (including areas).
 - location and date work performed.
 - asset type & asset ownership.
 - details of staff/plant used to carry out the Works.
 - (b) records to add to the graffiti "tags" register.
 - electronic photograph of tags including a 300 mm ruler to provide the scale.
 - brief description of the tag.
 - cost of removal.
 - details of location and time of recording.
 - electronic photograph of tagged area after removal or painting over.
 - (c) any damage or defects to Council assets that are observed while carrying out the Works.
 - (d) any complaints or enquiries.
 - (e) damage caused by the Contractor.
- .9 Provide the Superintendent with electronic records that can be used to populate the register of details of graffiti tags to assist on the apprehension and/or prosecution of graffiti painters. The electronic records shall be provided in the format required by the Superintendent.
- .10 Notify the Superintendent where graffiti cannot be removed and the methods that were tried.
- The Superintendent may visit the site and order further work.
- .11 Immediately notify the Superintendent of graffiti or bill posters not part of the work that can be viewed from and is within 50 m of any public road or pathway.
- Do not carry out work on such areas unless ordered by the Superintendent.

APPLYING PAINT COATINGS

- .1 This clause involves applying paint coatings to produce a satisfactory finish using a brush or roller. Do not use spray paint unless approved by the Superintendent.
- .2 Where already coated, test the existing paint for the presence of lead based paint using a test kit.
- Notify the Superintendent if lead is suspected and do not proceed.
- .3 Protect surfaces not to be painted, adjacent fixtures and equipment from damage and paint splatter (e.g. protective coverings, drop clothes, masking). Remedy any damage at no extra cost to the Principal.

- .4 Where the surface has no lead present, prepare the surface to be coated to form a clean, dry and sound surface for the application of paint:
 - (a) remove dirt, grease, dust and foreign matter.
 - (b) remove loose and flaking surfaces and patch prime as required.
 - (c) treat corrosion by wire brushing and rust converter.
 - (d) patch and fill with appropriate filler to provide an even surface.
 - (e) provide a key for the fresh paint (e.g. sanding, etching).
 - (f) neutralise and wash off any chemical residue.
- .5 Apply the number of coats recommended by the manufacturer appropriate for the surface.
- .6 Ensure "wet paint" warning signs are displayed at all times while painting and drying are in progress.
- .7 The finished paint coating shall have:
 - (a) the recommended film thickness.
 - (b) an even coverage.
 - (c) be free from defects, blemishes or evidence of poor workmanship (e.g. brush marks, sags, runs, streaks).

ANTI-GRAFFITI TREATMENT

- .1 The Work involves supply, delivery and applying the anti-graffiti coating. Generally the coating will be over porous surfaces (e.g. concrete, stone, masonry, etc).
- .2 The non-sacrificial anti-graffiti coating shall be a clear single or two part exterior anti-graffiti coating approved under the Australian Paint Approval Scheme, Specification P-144/1.
- .3 Prepare and coat the surface according to Clause C.2.03 APPLYING PAINT COATING. Ensure that the coating is worked into the porous surface.

CLEANING SIGNS

- .1 Clean both faces of the sign in place using appropriate water based cleaners.

Remove all the deposits from the surface so that surface is restored to a colour and texture near to the original.
- .2 Where graffiti is present and not water soluble notify the Superintendent.

CLEANING EXTERNAL PAVED AREAS

- .1 External paved areas are to be cleaned of the following :
 - (a) Mould, mildew, algae, moss, grime, etc.
 - (b) Chewing gum deposits.
- .2 Remove all the deposits from the surface so that surface is restored to a colour and texture near to the original.

Do not remove excessive amounts of granular joint material.

- .3 A surcharge will be paid when the concentration of chewing gum deposits exceeds 5 spots per square metre and all deposits have been removed. Provide suitable evidence that the concentration of chewing gum was more than 5 spots per square metre (i.e. a before and after photograph that clearly shows the concentration of chewing gum and a length reference in the same photo).
- .4 Collect cleaning residues and prevent residues from entering water courses or drainage lines.

CLEARING STORMWATER DRAINAGE LINES AND PITS

- .1 The specified stormwater drainage lines and pits shall be cleared of all silt, vegetation, rubbish and debris.
- .2 The equipment used shall be purpose built to remove the debris from the line or pit and not flush the debris further away. Suitable equipment includes trucks mounted with a suction device and waste receptacle.
- .3 The equipment shall have the capacity to quickly remove the debris and minimise disruption to traffic.
The rate of removal shall be demonstrated to the Superintendent.
- .4 All waste shall be disposed of at the nearest suitable waste disposal facility site.

4 ANCILLARY WASTE DISPOSAL

The work to be executed under this Clause consists of:

- (a) carting non-recyclable waste to a licensed landfill.
- (b) carting recyclable waste to a recycling facility.

Only use landfill or a recycling facility as appropriate that are licensed by the EPA for disposal of waste.

Waste that is nominated by the Superintendent for recycling shall not be disposed of as landfill without prior approval from the Superintendent.

Cartage and disposal of materials at the Nominated Recycling Centre shall be included in all rates provided.

However, waste that is nominated by the Superintendent as non-recyclable should be disposed of at a recycling facility wherever possible.

Transport waste in vehicles that comply with all legal requirements. Ensure that loads are covered and trucks are not overloaded. The truck driver is responsible for ensuring that no more than the legal mass is loaded.

Once waste is loaded into the Contractor's truck, the material is deemed to be the property of the Contractor. Therefore, any costs or benefits from the waste accrue to the Contractor (i.e. the Contractor is responsible for tipping fees, the Contractor may benefit from recyclable waste).

The Contractor shall provide the Superintendent with legitimate receipts (Tipping Tax Invoices) as proof of proper disposal before payment can be considered.

5 NON-RECYCLABLE WASTE DISPOSAL

The non-recyclable waste shall be loaded and disposed of at the appropriate landfill by the Contractor.

Bonded Asbestos material in any form shall be disposed of in a manner and at a site approved by the EPA and Workcover. The Contractor shall give advance warning to the site to accept asbestos.