Central Coast Council

CIVIL WORKS SPECIFICATION

CONSTRUCTION SPECIFICATION

2018

ROADS, TRANSPORT, DRAINAGE AND SUBDIVISIONS
DESIGN AND CONSTRUCTION
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Acknowledgement, Disclaimer and Limitations of Liability

Elements of the former Wyong Shire Council's Design Guideline, Construction Specification and Standard Drawings and Gosford City Council's Civil Works Specification have been adapted in the preparation of Central Coast Council’s Civil Works Specification.

Central Coast Council does not guarantee that these documents are free from errors and does not accept responsibility for any claims by any person or organisation resulting from the use or application of these documents and drawings or the originating documents and drawings.

The Central Coast Council Civil Works Specification was independently reviewed by SMEC Australia Pty Ltd in 2018 to ensure consistency between each volume and to ensure the adoption of current industry best practice.

Copyright ownership in this document belongs to Central Coast Council unless otherwise indicated.
Section 1 - Application of Civil Works Specification - Construction Specification

The Civil Works Specification has been compiled to outline Council's requirements for the planning, survey, design, construction and maintenance of public infrastructure assets, subdivisions and various private site works within the Central Coast Local Government Area.

The Civil Works Specification is referenced in the Central Coast Development Control Plan and consists of the following volumes, which shall be read in conjunction with one another as required and not in isolation. These documents are available on Council's website:

1. Design Guideline
2. Construction Specification
3. Standard Drawings

The Construction Specification has been prepared to assist Council's Construction Unit and various Service Providers by informing them of Council's requirements with respect to the construction of infrastructure assets, which will eventually be vested in and maintained by Council and to ensure that such works are provided to appropriate, safe and environmentally sustainable standards.

This Construction Specification and referenced documents provide minimum requirements and references for the construction and maintenance of civil works within the Central Coast Local Government Area. Works may include but are not limited to the following:

- Roads
- Intersections
- Pavements
- Pavement restorations
- Paths
- Cycleways
- Traffic facilities
- Earthworks
- Stormwater drainage
- Water supply
- Sewerage systems
- Water quality facilities
- Parks and reserves
Section 2 - Glossary of Terms

For the purpose of this Specification, the following definitions apply:

**Access Street** - A minor road which carries a low volume of traffic, providing direct access to a limited number of allotments.

**Accredited Certifier** - An Accredited Certifier is a person who holds a certificate of accreditation under the *Building Professionals Act 2005* in relation to particular matters. An Accredited Certifier in general may issue Compliance Certificates for matters within his/her area of accreditation.

*Note: An Accredited Certifier may not certify construction in respect of water and sewer works pursuant to Section 306 of the Water Management Act 2000. Works on public roads under the Roads Act 1993 may preclude an Accredited Certifier from being appointed. In the case of the provision of water and sewer servicing, Council will issue a Section 307 Certificate of Compliance under the Water Management Act 2000 when requirements have been met.*

**AEP** - Annual Exceedance Probability.

**Ancillary Road Asset** - Are road elements including kerb and gutter, drainage pits, drainage lines, subsoil drainage lines, pavement markings and street furniture.

**Applicant** - The person or corporation making application to Council for approval for a proposed development.

**Asset** - A physical component of a road system or network. An asset is considered worthy of separate identification if it delivers services or benefits to the community of sufficient current or future value to warrant control and management on an individual basis. Typical assets include sections of pavements, bridges, culverts, traffic signals, signs, road furniture, road reserves, etc.

**Australian Height Datum (AHD)** – The datum surface approximating mean sea level as adopted by the National Mapping Council of Australia in May 1971

**Authorities** - Authorities such as Telstra, Optus, Ausgrid, Department of Planning, Roads and Maritime Services, AGL, Sydney Water, etc.

**AR&R** - Australian Rainfall and Runoff.


**Carriageway** - The portion of road or bridge used by vehicles (including shoulders and auxiliary lanes or between the face of kerbs).

**CBR** - California Bearing Ratio.
Certifying Authority - A Certifying Authority may be Council or an Accredited Certifier approved by Council.

Collector Road - A minor road linking access streets to major roads, possibly providing bus routes and giving road access to allotments.

Consulting Geotechnical Engineer - An experienced and qualified person or company engaged by the Service Provider to provide advice, inspection reports and recommendations and testing as required by various parts of this Specification in relation to Geotechnical matters.

Contractor - The person, private sector entity or consortium bound to execute the contract.

Council - Central Coast Council. Council may also be referred to as the Principal under a Construction Contract.

Council’s Representative - The staff member nominated by Central Coast Council to act on Council’s behalf in the discharge of its contractual responsibilities and/or the person responsible/delegated to make a decision for Council. This person may be referred to as the Superintendent under a Construction Contract.

CPI - Consumer price index.

Cycleway - Portion of a road or footpath devoted to the use of bicycles.

DA - Development application.

DBYD - Dial Before You Dig.

DCP - Development Control Plan.

Design - In relation to plant or a structure, it includes a design of part of the plant or structure and redesign or modification of the design.

Detention Basins (retention/retarding basin) - A storage pond, basin or tank used to reduce and attenuate the peak discharge within a drainage system. It is also interchangeable with sedimentation basin when sediment control is the main purpose of the basin.

Engineer - (Structural, Pavement, Civil, etc.) – Where used in this document refers to a person of suitably experience (as a guide not less than 10 year industry experience) and qualification to undertake the relevant elements of the work and are eligible for corporate membership of the Institution of Engineer, Australia (or equivalent professional industry body).

EY - Exceedances per year.

Floodplain - As defined by the current NSW Floodplain Development Manual. Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
Floodway Areas - As defined by the current NSW Floodplain Development Manual. Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flow, or a significant increase in flood level.

Floodway - As defined by the Austroads A longitudinal depression in a carriageway specially constructed to allow the passage of floodwater across it without damage. The cross section of a stream in flood plus a nominated area for freeboard.

Footpath - A path or paved area reserved for the movement of pedestrians and manually propelled vehicles and motorised mobility devices.

Geocentric Datum of Australia (GDA) – The datum surface approximating the shape of the earth’s surface as adopted by the Intergovernmental Committee for Surveying and Mapping in May 1990.

Handover Documents - All documents provided by the Service Provider to the Central Coast Council on Practical Completion as specified, including WAE drawings.


Late Fee - Any unauthorised work will incur a late fee in accordance to Council’s Fees and Charges.

LEP - Local Environmental Plan.

LGA - Local Government Area. This refers specifically to the Central Coast Local Government Area which is defined by Frazer Park and Crangan Bay in the north, Wisemans Ferry in the south and Kulnura in the west and the Pacific Ocean in the east.

Lane - A portion of the paved carriageway marked out by kerbs, painted lines or barriers, which carries a single line of vehicles in one direction. A lane is generally between 3.0 and 3.5 m wide. A single carriageway road normally has at least one lane in each direction.

Local Street - A minor road which carries a higher volume of traffic than an access street but still provides direct access to allotments.

Local Distributor Road - A road linking access streets to major roads, providing bus routes and giving restricted access to allotments.

Map Grid of Australia (MGA) – a rectangular coordinate system using a Universal Transverse Mercator (UTM) projection based on the Geocentric Datum of Australia (GDA). It is used by all states and territories across Australia.

NATA - National Association of Testing Authorities, Australia.

NSWRFS - NSW Rural Fire Services.
Obstruction - Any object which could impede or prevent the free and/or safe passage of pedestrians and/or vehicles.

Path - A footpath or shared path (refer to each respective definition).

Permanent Restoration - A restoration in accordance with Council’s Specification is applied to the road or path after a temporary restoration has completed and left exposed to the public for a specified period of time.

PMP - Project Management Plan.

PSM - Permanent Survey Marks – Marks in the style or form for a permanent survey mark as described in the NSW Surveying and Spatial Information Act and Regulation.

Practical Completion - That stage in the execution of the work under the Contract when the works are complete except for minor omissions and minor defects that do not prevent the works from being reasonably capable of being used for their intended purpose, as determined by Council’s Representative.

Principal Certifier - For subdivision work means the certifier appointed as the Principal Certifier under section 6.12(1) of the EP&A Act 1979. A Service Provider must appoint a Principal Certifier for each development project involving a subdivision. For the purposes of this Specification Principal Certifier could also mean the Principal Certifying Authority.

Principal Contractor - Under the Environmental Planning and Assessment Act 1979 for building work is that person responsible for the overall co-ordination and control of the carrying out of the building work. A Principal Contractor may also be required under the Work Health and Safety Regulation 2017. The Service Provider shall advise Council prior to commencement of any works who is the Principal Contractor in respect of both. In this Specification the Principal Contractor may also be referred to as “the Service Provider”.

The Service Provider undertaking construction work for Central Coast Council shall be appointed as the Principal Contractor and accepts all the obligations associated with this role under the Work Health and Safety Regulation 2017.

Private Property - Property outside of the project, site boundary or road reserve. This is generally neighbouring property owned or leased by private owners and tenants.

Project Manager - The Service Provider shall appoint a person as the Project Manager for the Project. This person must be readily available and have sufficient authority and ability to discuss and resolve problems and act as the principal contact with Council’s Representative.

A Service Provider who chooses to adopt this role must be aware that Council does not become involved in co-ordinating activities or giving advice beyond Council responsibilities.

The Service Provider’s Project Manager may also be referred to as the Service Provider in this Specification. This person may be referred to as the Contractor’s Representative under a Construction Contract.
Proponent - A person or Service Provider that puts forward a proposal to undertake work.

Restoration Order - A request to Council to undertake permanent restoration on behalf of a Service Provider.

Risk - The effect of uncertainty on objectives.

Roads Authority - A national or state roads authority, municipality, other body or individual responsible for the care, control and maintenance of road infrastructure.

Road Opening - A road opening is any form of excavation or digging of the road reserve including test bores for Geotechnical investigation purposes.

Road Opening Permit - A permit authorising the holder to undertake a road opening activity.

Road Pavement - Refer to definition for Carriageway.

Road Reserve - A legally defined area of land between the legal road boundaries within which facilities such as roads, paths and associated features may be constructed for public travel. Where roads have not been formed, it also refers to so called 'paper roads'.

Safety Barrier - A physical barrier separating roadside hazards or opposing traffic and the travelled way, designed to resist penetration by an out-of-control vehicle and as far as practicable, to stop or redirect colliding vehicles.

Service Provider - Any parties such as contractors, suppliers, consultants (accredited certifier), developers, authorities, or Council staff responsible for planning, designing and constructing the works.

Shared Path - A paved area particularly designed (with appropriate dimensions, alignment and signing) for the movement of cyclists and pedestrians, but on which bicyclists must give way to pedestrians.

Shareway - A minor road which carries a low volume of traffic in two directions, providing direct access to a limited number of allotments. Vehicle, pedestrian and recreation use is shared, with pedestrians having priority.

Site - Land and structures within the extent of works area / site boundary, including storage areas. The site area includes privately owned property that shall be dedicated to Central Coast Council as a public asset.

Specification - Detailed statement of materials, dimensions and quality for all work that shall be built, installed, or manufactured for Central Coast Council or for work which shall be dedicated to Central Coast Council as a public asset.

SSM - State Survey Mark – A form of Permanent Survey Mark as described in the NSW Surveying and Spatial Information Regulation.
**Stakeholder** - An individual or group of individuals such as employees, directors, shareholders, developers, Service Providers, consultants and external organisations who have an interest in the project whether through their involvement with the project or because they will be impacted by its outcome.

**Sub-contractors** - These are Contractors engaged by the Principal Contractor. The identity of proposed Sub-contractors and their proposed scopes of works shall be provided to the Certifying Authority prior to engagement.

Council reserves the right to not accept any Sub-contractor working on a site based on previous poor compliance with Council’s requirements.

Sub-contractors may also be suppliers of materials to be incorporated into the works. Sub-contractors who supply materials for the works, may also be referred to in this Specification as “Suppliers”.

**Surveyor** - A registered Land Surveyor as defined in the NSW Surveying and Spatial Information Act and/or an Engineering Surveyor qualified to carry out civil works surveying projects.

**SWMS** - Safe Work Method Statement.

**Temporary Restoration** - A restoration in accordance with Council's Specification is applied to the road or footpath following the completion of a road opening activity or trenching. A temporary restoration must be safe and trafficable at all time until a permanent restoration is carried out.

**TMP** - Traffic Management Plan.

**Unauthorised Works** - Works that are carried out without a permit or approval from Council.

**Utility Authority** - A national or state roads authority, municipality, other body or individual responsible for the care, control and maintenance of utility infrastructure.

**Utility Services** - Public infrastructure services including water, sewerage, drainage, gas, electricity, telephone, telecommunication or other like service.

**Verge** - The area between the carriageway and the property line. It allows provision for services, footpaths, cycle paths, shared paths, street trees and street furniture. Additional width will be required for bus bays or where major transmission services are to be provided in the verge. It includes the shoulder, if provided.

**WAD** - Works authorisation deed.

**WAE** - Work-as-executed.

**WSAA** - Water Services Association of Australia's.

**Work** - All works required to complete the project as specified and approved.
Section 3 - General Matters

3.1 General

This volume of the Civil Works Specification applies to all civil works required by or performed on behalf of Council.

Project specific requirements shall be provided by Council’s Representative where applicable. Where specifications that are contrary to all or part of this Specification are contained in a Development Consent or Tender/Contract Document then those specifications shall be applied.

If this Specification does not cover a requirement for a particular construction activity, then the provisions of the current Australian Standard shall apply unless otherwise instructed by Council’s Representative.

When this Specification makes reference to specifications published by other organisations, such as the Roads and Maritime Services of New South Wales, only the technical requirements of those specifications apply unless otherwise stated. Clarification shall be obtained from Council’s Representative when a technical requirement is not provided within any specification.

When a specification for a particular item of construction is not defined by this Specification or Australian Standards then Council’s Representative shall determine the appropriate specification to be applied.

This Specification is not for the purposes of providing an interpretation of what the Service Provider is required to comply with in regards to various Acts and Regulations. It is expected that the Service Provider is familiar with their obligations to comply with various Acts and Regulations.

3.2 Reference Documents

Reference documents include but are not limited to:

- Austroads publications.
- Roads and Maritime Services documents including manuals, specifications and test methods.
- AUS-SPEC and Council’s amendments.
- Australian Standards.
- Engineers Australia Publications.
- Institute of Public Works Engineering Australasia Specifications.
- Water Services Association of Australia documents relating to supply of water and sewerage services and their respective Supplements.
- Australian Asphalt Pavement Association’s Specifications.
3.3 Conflicting Standards and Guidelines

Refer to Section 3.3 Conflicting Standards and Guidelines in Council’s Civil Works Specification – Design Guideline.

3.4 Pre-construction Information

3.4.1 Coordination of Pre-construction Planning Activities

The Service Provider shall ensure that all Development Consent requirements prior to the issuing of a Construction Certificate and requirements for gaining statutory approvals are met prior to the start of any Construction Activities.

This includes the integrating of undertakings made in the Development Application proposal, accompanying environmental and other report recommendations, State or Federal Authorities approvals requirements, Utility Suppliers information, further Council approvals under the Roads Act 1993, Local Government Act 1993 and Water Management Act 2000 and Development Consent Conditions.

Consent to work on privately owned land, other than that owned by the Service Provider shall be obtained in advance of the commencement of construction.

3.4.2 Pre-construction Site Activities

The Developer and their Survey Consultant are responsible for the Preservation of Survey Infrastructure (Surveying and Spatial Information Act and Regulations), all centre line pegging, boundary pegging, provision of suitable survey control marks for construction and providing survey marks information.

The Service Provider is responsible for all survey required for construction.

Recovery marks shall not to be placed in locations that present a hazard to pedestrian or vehicular traffic.

All pre-construction site activities shall be carried out under the authority and supervision of the Service Provider. All pre-construction activities shall be carried out in accordance with all approval conditions pertaining to the site.
3.4.3 Works Subject of Approvals by Other Authorities

Where conditions have been imposed under an integrated approval or where the Service Provider is required by legislation to obtain approval from others the following applies:

- The design and construction of works shall be carried out to meet the relevant Authority’s specifications in addition to those of Council.
- The Service Provider is responsible for obtaining authorisation to remove survey marks within the scope of the works, from the Surveyor General of NSW.
- The Service Provider is responsible for obtaining any permits and licences, obtaining required inspection(s), achieving work standards and gaining final approval of relevant Approval Authorities.
- Copies of approvals, permits and licences shall be obtained from Approval Authorities by the Service Provider and shall be provided to Council’s Representative prior to commencement of site activities.
- Copies of final approvals of works and documentation verifying compliance of requirements from Approval Bodies shall be provided to Council by the Service Provider before Council’s final inspection and approval of the works.

The Service Provider shall notify the Approval Authorities and Council of all changes and obtain any additional approvals that may be required.

3.4.4 Approved Construction Drawings

Approved construction drawings are drawings that have been endorsed or approved by Council for the purposes of civil construction. These may include drawings issued with a construction certificate, approval for works under the Roads Act 1993 and other relevant Acts, or Council Quotation or Tender.

Construction specifications shall be Council’s current construction specifications at the time of Council approval of the Construction Drawings.

Should developer works not commence within five (5) years of Council approval of the civil construction drawings, the drawings shall be revised by the Service Provider to meet Council’s current Civil Works Specification and then resubmitted to Council for construction approval.

Where details or specifications shown on approved drawings are different to the requirements of this Specification then the requirements of this Specification shall be applied to the works. Departures from this requirement may be made only with approval from Council’s Representative.

3.4.5 Extent of Approved Works

The approved works are those works covered by a Construction Certificate and/or Council approved construction drawings and shall include any ancillary works required to complete the works.
Ancillary works are those works which are necessary for the new works to safely and effectively function on a sound engineering basis. Ancillary works may not be detailed or fully shown. Ancillary works may involve temporary and permanent protection works about the interface of new works and existing site conditions and works to transition the new works existing site conditions. All ancillary works shall be carried out to the same standards as required by this Specification.

### 3.4.6 Further Applications to Council During Works

During the course of construction it may become necessary to make applications to Council where approvals have not already been given for:

- Road closures.
- Works within the road reserve.
- Removal of street trees.
- Removal of trees within the development site.
- Connection to or adjustment and relocation of water and sewer mains and installations.
- Modification of the Construction Certificate to carry out different works.
- Modification of the Development Consent to vary the Development Consent conditions.

Council’s consideration of these applications may involve periods of advertising and referral to other authorities.

### 3.5 Pre-commencement Requirements

Works on any subdivision or works within the road reserve, shall not commence until the Service Provider holds Compliance Certificates confirming pre-commence conditions of development consent have been satisfied and the conditions of the Surveyor General’s Approval to Remove Survey Marks have been satisfied.

Follow confirmation of compliance for pre-commence conditions of development consent, the persons having the benefit of the development consent shall lodge a “Notice of Intention to Commence Subdivision Works” with Council / Principal Certifier with a minimum of two (2) working days’ notice.

Once the “Notice of Intention to Commence Subdivision Works” is acknowledged by Council/Principal Certifier, a mandatory On-site Pre-commence meeting between the persons having the benefit of the development consent, their contractors and Council/Principal Certifier shall be held.

### 3.6 Departure from Approved Works

Departures from approved works shall result in an instruction from Council’s Representative to rectify the works to comply with the approved drawings.
If the approved drawings are inadequate or do not reflect site conditions or prove to be impracticable, additional or alternative and or remedial works maybe necessary. Such works shall be approved by Council’s Representative or Accredited Certifier prior to their commencement. Approval may involve the submission of plans, reports and or a range of applications to Council and other Authorities. In some cases, it shall be necessary for the Service Provider to lodge an Application for Modification of the approved Construction Certificate.

3.6.1 Departure from the Specification

Consideration may be given for products or work methods which do not comply to Central Coast Council Civil Works Specification. Details of the proposed departure from the Specification need to be submitted to Council’s Representative for approval prior to construction or use.

3.6.2 Unapproved Works

Where unapproved works are undetected during the course of construction, the work-as-executed drawings shall be accompanied by a report(s) and calculations prepared by the Service Provider’s Consultants providing justification for acceptance of the unapproved works.

The report(s) shall include an explanation as to how the unapproved works comply with Council’s Civil Works Specification or adequately satisfies the intent of this document.

Where the report(s) are not approved by Council’s Representative, the Service Provider shall rectify the non-compliance to the satisfaction of the Council’s Representative.

Approval from Council’s Representative or Accredited Certifier of any remedial works is required prior to their commencement. Approval may involve the submission of a range of applications to Council and other Authorities.

3.7 Environmental and Heritage Protection

3.7.1 General

Environment and heritage protection requirements apply to all works which will disturb the soil surface, vegetation (including grasses, shrubs and trees), horticultural features, relic or site materials. These requirements are covered by various Acts and Regulations including the Heritage Act 1977, Threatened Species Conservation Act 1995 and the Protection of the Environment Operations Act 1991.

3.7.2 Environmental Requirements Prior to Site Works

Before any clearing begins, Council’s approval to remove trees must be obtained as required by conditions of the Development Consent and in accordance with Council’s DCP.

The protection of vegetation or other environmental or heritage items must be complied with during construction. The works to be carried out must be consistent with:

- Any specific Development Consent conditions.
• The approved Environmental Management Plan and/or the Erosion and Sediment Control Plan, Soil and Water Management Plan and other approved documentation.

• Any site induction information provided by the Environmental Consultant or Consultant Ecologist.

Construction details and methods must be selected to ensure that the requirements of the approved Environmental Management Plan and Development Consent are complied with.

The location of all trees and vegetation to be preserved should be identified on the Environmental Management Plan or the Approved Construction drawings. The Service Provider shall not proceed with any work until this information has been made available to the Council. In the absence of specific details relating to tree protection being described in consent approval documentation or Construction Certificate drawings or reports, then the requirements of AS4970 – Protection of Trees on Development Sites shall apply.

The Service Provider is to erect approved protective fences around all trees and patches of native vegetation to be retained and protected prior to commencing any works. Access into such areas for any purpose will not be permitted unless approved by Council.

Council reserves the right to enter onto the land and carry out protection measures in the event they are not implemented prior to commencement of works. The cost of any such protection measures will be required to be fully reimbursed to Council by the Service Provider prior to any further development works proceeding.

A performance bond in the form of a bank guarantee shall be lodged with Council by the Service Provider to ensure effective environmental control and protection measures are implemented. This bond will be required to be lodged prior to the commencement of Construction and will be released following submission of the maintenance/defects bond and after a satisfactory final inspection has been completed. The value of this bond will be in accordance with Council’s current fees and charges. The Environmental performance bond may not be required on some development works where the risk of environmental damage is minimal. Council may recover costs from the bond in the event that works need to be done in an emergency or through lack of response to instructions issued to the Service Provider.

3.7.3 Heritage Conservation and Protection

Measures for the protection of heritage items identified in the Development Consent and Approved Plans and drawings are to be completed prior to any clearing or earthworks. The Service Provider is responsible for ensuring that arrangements are in place for any ongoing requirements such as the reporting of additional items of Aboriginal Heritage.

Where a known item or site is affected by or adjacent to a development, specific conditions of consent will require protection measures during construction.

Where in the course of undertaking development works a person uncovers or discovers a relic (within the meaning of the Heritage Act 1977) or Aboriginal relic or place, they are to:

• Cease work on the site.
• Take appropriate measures to secure and protect the site or relic, including fencing.
• Contact Council’s Representative.
• Notify either the Heritage Council and the Office of Environment and Heritage, as appropriate, of the discovery as required under the Heritage Act 1977 or the National Parks and Wildlife Act 1974.

3.7.4 Fire Restrictions

Where conditions of Development Consent require the carrying out of bush fire hazard reduction works, a certificate is to be obtained under the Rural Fires Act 1997 for any hazard reduction burning. Requirements for this certificate should be determined through the Integrated Development process.

The Service Provider is to address any bushfire risks associated with his construction activities and implement any mitigation measures identified in the risk assessment.

3.7.5 Noise Control
All construction equipment is to be fitted with the recommended noise suppressor in accordance with statutory requirements. The Service Provider is to comply with the statutory regulations and take all practical precautions to minimise noise levels from the development site.

3.7.6 Waste Management
All construction wastes are to be stored on-site in a secure manner until they can be removed off-site. Containment or covering of wastes which may be spread by wind or rain is required.

Refer to other chapters of Council’s DCP for specific requirements on Controls for Site Waste Management.

Disposal of construction wastes on site is not acceptable.

3.7.7 Final Site Cleaning
Upon completion of works, all buildings, plant, spoil, debris, excess material and wastes arising from the development works shall be removed and the site left in a safe, clean and tidy condition.

All roads, drains, signs and other infrastructure are to be free of sediment, dust, grime and other pollutants. Structures are to be in a ready to use condition.
3.7.8 Council Reserves and Council Controlled Lands to be Dedicated to Council

Reserves to be dedicated to Council, with the exception of specified Heritage items, shall be left in a safe and tidy condition, free of all hazards to public safety. These hazards include but not limited to wells, shafts, dangerous ruins, building remnants, spoil, stockpiles and waste.

Landscaping and embellishment works shall be carried out in accordance with the approved Landscape Design Plan and Report where required.

3.7.9 Transportation of Materials

Transportation of earth, sand, road construction material, loose debris and any loose materials to or from the development site shall be in a manner that will prevent the dropping of material on surrounding roads. The wheels, tracks and body surface of all vehicles and plant leaving the site shall be free of material that may be unknowingly deposited during operation.

All loads shall be covered to prevent loss of materials during transportation.

3.7.10 Work On or Near Trees

3.7.10.1 Tree Removal and Work on Trees

Council’s approval in accordance with DCP (Tree Management) must be obtained before removing or performing any work on trees, including trimming, pruning, root cutting or repairs. Any work permitted to be carried out on trees is to be performed by an Arborist approved by Council in accordance with Council’s specifications for tree works.

Trees to be removed are to be clearly marked onsite with a yellow tape to correspond with those approved for removal.

Removal of trees is to be undertaken so that there is no damage or injury to trees or other native vegetation to be retained. Council may nominate an appropriate felling method by way of consent conditions where damage to remnant trees is likely to occur during felling. This may mean that precision felling by chainsaws is necessary instead of machine felling.

3.7.10.2 Working Near Trees

Existing trees are legally protected by Council’s Tree Preservation Order. The Service Provider shall inspect and mark all trees for preservation in conformance with the requirements of Council’s Representative.

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

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

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 or trenchless methods, to preserve root systems intact and undamaged.

Be aware of the restrictions on work near trees and if required seek direction from Council’s Representative.
Do not cut tree roots exceeding 50mm diameter. If 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.

Backfill 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 300mm 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 200mm above the original ground surface. Immediately after backfilling, thoroughly water the root zone surrounding the tree.

3.7.10.3 Habitat Trees

Habitat trees shall only be felled where approved and under the supervision of the Service Provider’s Consulting Ecologist or other Environmental Consultant acceptable to Council.

3.7.11 Working Hours

Where not specified in a Development Consent or required by other Authorities, working hours for works shall be restricted to Monday to Friday between 7.00am and 6.00pm and Saturday 8.00am to 4.00pm. No work shall take place on Sundays or public holidays.

The Service Provider shall consider further limiting working hours either throughout the works, in particular instances or timeframes in the vicinity of sensitive developments e.g. hospitals, schools, during public events, etc.

Exceptions may be made for works on existing roads where traffic conditions make works hazardous or would result in unacceptable traffic delays. Arrangements for these works shall be made with Council and/or Roads and Maritime Services (if applicable) in conjunction with applications under the Roads Act 1993 for the subject works.

3.8 Haulage, Storage and Quality of Materials

3.8.1 Haulage Routes

Details for approval of haulage routes shall be supplied at the request of Council’s Representative. Details to be provided may include but not be limited to: type, number, weight of vehicles, planned routes, road condition report and vehicle management plan.

Visual assessments of the approved haulage route(s) will be carried out by Council prior to, during and on completion of works to determine if the haulage associated with the development has caused any specific damage to the route.

Damage to roads by haulage plant shall be satisfactorily repaired at no cost to Council. Damage, which in Council’s view presents a hazard or will accelerate more damage, is to be repaired as it becomes apparent. Any temporary restoration works on the haulage route necessary during the course of construction shall be carried out in accordance with this Specification or as agreed between Council’s Representation and the Service Provider.
3.8.2 Storage of Materials

All materials shall be stored in a safe, tidy and nonhazardous manner. Safety fencing, barricades, signposting and sediment controls shall be provided as required to ensure such sites are in accordance with *Work Health and Safety Regulation 2017*, relevant environmental requirements and this Specification. Reinstatement of stockpile areas shall be approved to the satisfaction of Council’s Representative.

Storage of pipes, gravel and other materials on public roads or reserves is not permitted unless approval by Council’s Representative is provided. The request for approval shall contain supporting documentation to ensure satisfactory restoration is achieved. This shall include (but not limited to) a survey accurate level and detail plan with spot levels and contours, adequately depicting the existing surface topography covering the proposed stockpile and surrounding areas. Following surface restoration of the stockpile site to requirements of this specification for disturbed areas, a work as executed survey covering the stockpile and surrounding area shall be submitted to Council for review. Refer to Appendix A - Work-as-Executed (WAE) Drawings of this specification.

3.8.3 Materials Quality

Materials used shall comply with relevant standards and be:

- In ‘as new’ condition.
- Free of structural damage.
- Free of contamination.
- Defect free.

If required, the Service Provider shall provide to Council’s Representative full information describing the source of supply, mode of supply and place of manufacture of any material.

*Processed recycled material* may be used in pavement, earthworks and drainage construction provided the properties of the material meet the requirements of the material as required by this Specification or confirmed to be suitable by the Consulting Geotechnical Engineer and Council’s Representative.

Recycled material shall conform to the requirements of the IPWEA Publication *Specification for the Supply of Recycled Materials for Pavements, Earthworks and Drainage 2010*. Recycled material supplied to site shall have a resource recovery exemption.

When required by this Specification or requested by Council’s Representative, test results of the particular materials proposed shall be submitted to Council’s Representative or the Accredited Certifier for approval prior to use. Council’s Representative may accept materials for which Council holds current acceptable test results. Specific material requirements are detailed in the relevant sections of this Specification.

3.9 Safety, Access, Public Utilities and Damage
3.9.1 Safety
The Service Provider shall be responsible for adequate safety precautions during progress of the works, in accordance with the relevant legislation, regulations, standards and codes of practice. This includes but is not limited to the safety of the public, employees and contractor personnel. The provision and erection of any signs, lights and barricades necessary for pedestrian and traffic safety in public roads or places are also part of the responsibility for adequate safety precautions.

3.9.2 Private and Public Amenity
Uninterrupted access and utility servicing must be maintained to all properties throughout the development works unless otherwise by Council or other relevant utility authorities. Applications may be made to Council under the Roads Act 1993 and Water Management Act 2000 seeking disruptions to access and servicing. Assessment of these applications may involve landowner notifications and referrals to other authorities.

3.9.3 Damage to Property
The Service Provider shall take adequate precautions to prevent deterioration and damage to private property, public roads, public utilities and reserves during construction.

The Service Provider shall organise preconstruction inspections by adequately qualified independent persons to identify the condition of private fences, driveways, landscaping, structures and other property improvements that are within proximity to the proposed development works.

Council's Representative may direct the provision of temporary works or restrictions on construction methods considered necessary to protect private lands and improvements. Council shall take into consideration any written agreement with the landowner obtained by the Service Provider gaining permission to undertake works on or adjacent to the private lands before any direction is issued.

Damage to the adjacent road by haulage plant shall be satisfactorily repaired at no cost to Council. Any temporary road restoration works necessary during the course of construction shall be carried out in accordance with this Specification or as agreed between Council's Representative and the Service Provider.

3.9.4 Public Utilities in the Work Area
The Service Provider shall ensure that accurate information is obtained in relation to the location of utilities within the work area and the requirements of all Utility Authorities in regards to working near their assets.

A Dial Before You Dig enquiry shall be made by the Service Provider prior to any excavation work in accordance with the requirements of the Energy Legislation Amendment (Infrastructure Protection) Act 2009.

The Service Provider shall immediately inform the relevant Utility Authority and Council's Representative of any damage occurring to utility mains, services and installations.
Adjustments, relocations and replacement of public utilities shall only be undertaken following approval from the appropriate Utility Authority. The cost of all works associated with this shall be the responsibility of the Service Provider.

3.9.5 Permanent Marks, State Survey Marks and Cadastral Reference Marks

Precautions shall be taken to protect and preserve any Permanent Marks (PM) and State Survey Marks (SSM) and Cadastral Reference Marks relative to or affected by the works. The Service Provider shall be responsible for the replacement of any disturbed marks to the conditions of the Surveyor General’s Approval to Remove Survey Marks using a Land Surveyor Registered in the State of New South Wales.

3.9.6 Private Property and Council Controlled Lands

3.9.6.1 Private Landowner’s Permission

The Service Provider is responsible for gaining written consent to enter or carry out works within private property. Council also requires the Service Provider to obtain the landowners consent for works within Council and interallotment easements over private lands.

The Service Provider shall ensure that this consent is not withdrawn prior to the works being completed. Council’s Representative shall be informed immediately upon the withdrawal of consent by a landowner.

The Service Provider shall ensure that the landowners consent and any conditions are clear. The Service Provider shall make a photographic record of the site prior to the commencement of work to minimise the possibility of any dispute over the effects of construction on the private property.

3.9.6.2 Permission for Works on Council Roads, Lands and Reserves

Under the Roads Act 1993, approval to work within a public road reserve is required to be obtained from Council or the Roads and Maritime Services in the case of classified roads.

For works required within a Council road reserve as part of a Development Consent, the Service Provider shall obtain a Roads Act 1993 approval prior to commencement of work.

All other works required within a Council road reserve shall obtain a road opening permit.

Access onto, use or performance of works on Council owned private land, drainage reserves, public reserves, Crown Land under Council care and any other land or easements controlled by Council may not be carried without specific Council approval.

3.9.6.3 Access to Adjacent Property

The Service Provider shall maintain safe and convenient passage for pedestrians and vehicles to and from property entrances and buildings at all times unless otherwise negotiated by the Service Provider with the property owner and all property tenants. Temporary connections to intersecting roadways shall be provided and maintained as necessary.
Prior to the commencement of construction, the Service Provider shall provide written notice to all traders and occupants of adjacent properties where access to or from those properties may be affected by the works to be undertaken.

3.9.7 Use of Explosives
The Service Provider shall not use explosives for any works.

3.10 Compliance Inspections, Testing and Documentation

3.10.1 Construction – Testing, Inspections and Documentation

It shall be the responsibility of the Service Providers to present to the Principal Certifier works as executed drawings and documentation demonstrating compliance with:

- The Development Consent,
- The Subdivision Works Certificate (Subdivision Works Construction Certificate),
- Civil Works Design Approvals issued by Council,
- This specification and
- Requirements from any other authorities.

3.10.1.1 Mandatory Inspections
Council as the Principal Certifier for subdivisions and associated works, require mandatory inspections by Council as the Certifier or an accredited Certifier of the following;

- On-Site Pre-Commence Meeting with Council as the Principal Certifier and/or the relevant authority – prior to construction commencing,

- Road Pavement Subgrade – once ready for placement of subsequent pavement layer,

- Road Pavement Layer – once ready for placement of kerbs and channels

- Concrete Works – after preparation of ground surface, placement of formwork and reinforcement ready for placement of concrete, including (but not limited to):
  - Pit construction
  - Kerb and Channel construction
  - Rigid Pavement construction
  - Driveway and Access ways
  - Footpath and shared path

- Structural Elements - as required by the structural certifier and this specification, including (but not limited to):
  - Bridges
  - Concrete Pavements
  - Retaining Walls
- Stormwater Pits with specific structural design

- **Pavement** – once ready for placement of following elements;
  - Sealing
  - Asphalt

- **Pre-final completion inspection** -
  The Service Provider shall request a pre-final completion inspection to identify all items that are incomplete or defective.

- **Final Completion Inspection**
  The Service Provider shall request a final completion inspection upon completion of all rectified or completed items previously identified during the pre-final completion inspection.

It is the Service Providers responsibility to book a mandatory inspection providing a minimum of 48 hours’ notice to Council as the Certifier for the works.

Construction must not proceed to subsequent works prior to obtaining written notification from Council or the Accredited Certifier that the mandatory inspection demonstrated compliance.

### 3.10.1.2 Inspection and Testing

Inspections and testing shall be undertaken in accordance with this Specification and all costs shall be met by the Service Provider.

Copies of all inspection reports and test results are to be provided to Council’s Representative or the Accredited Certifier.

### 3.10.1.3 Other Inspections

Council as the Principal Certifier for subdivisions and works on lands and roads under Council control may carry out other inspections of the following:

**Sediment Control, Environmental, Vegetation and Heritage Protection:**
- Installation of protection measures,
- To confirm ongoing maintenance of protection measures,
- To confirm restoration, stabilisation and suitability of site for removal of protection measures.

**Clearing:**
- Prior to commencement of clearing but after set out or marking of trees to be retained and / or delineation of “No Go” areas,
- During clearing works,
- When clearing is completed.

**Earthworks:**
- At commencement,
- During works,
- At completion of works.

**Subsurface Drainage:**
- Before placement of pipes after trenching,
- Before backfilling,
- After backfilling,
- During final flushing at completion of works.

**Stormwater drainage works:**
- During trench excavation,
- During pipe laying,
- During trench backfilling.

**Miscellaneous inspections:**
- Other inspections as detailed in this specification or as required by Council’s Representative,

It should be noted that the pre-final completion inspection needs to be carried out over a number of days depending on the size of the site. Pre-final inspections shall not be started until works are complete unless it is possible to carry out inspections where there is no opportunity for damage to items being inspected from ongoing construction activities to occur. The time when the pre-final completion inspection begins will be up to the discretion of Council’s Representative.

When items identified in the pre-final inspection are not rectified or completed at the time of the final completion inspection then additional fees will be charged to the Service Provider for any additional inspection required to complete the final completion inspection.

A satisfactory inspection or approval to proceed from one component of works to the next in no way absolves the Service Provider from the responsibility for remedying defects or uncompleted items of works identified at any time up to the end of the maintenance / defects period.

During the progress of works the following persons:
- Council’s Representative,
- Accredited Certifiers,
- Principal Certifier,
• Consultants or specialists employed or engaged by the Service Provider, Council, an Accredited Certifier or the Principal Certifier,

Acting only within their role shall at any time:
• Have uninterrupted access to the works.
• Require the Service Provider’s equipment or personnel be made available for examination or testing purposes.
• Instruct the removal or amendment of any such work or material not in accordance with the approved plans, appropriate specifications, standards or best industry practice.

3.10.1.4 Work-as-Executed Drawings and other Compliance Documentation

The provision of work-as-executed drawings and other compliance documentation form part of the approved works. For the preparation of work-as-executed drawings refer to Appendix A - Work-as-Executed (WAE) Drawings of this Specification.

3.10.2 Council as the Certifier for Subdivision Works

3.10.2.1 Notice for Inspections

Forty-eight (48) hours’ notice shall be given for mandatory inspections to Council’s Representative or the Accredited Certifier.

Failure to request a mandatory inspection may lead to the portion of the work not being accepted.

3.10.2.2 Inspections Outside Normal Council Hours

It may be acceptable in the particular case to arrange inspections of work outside of Council’s normal working hours. The cost of these inspections shall be borne by the Service Provider. This cost will be determined by Council and shall be paid prior to the issue of a subdivision certificate, a Compliance Certificate or other documentation confirming completion of the subject works.

3.11 Compliance Certificates, Maintenance, Defects and Bonds

3.11.1 Compliance Certificates under the Environmental Planning and Assessment Act 1979

When Council is the Principal Certifier, compliance certificates required to be issued by the Principal Certifier are not required to accompany an application for a subdivision certificate.

A Compliance Certificate may be issued for subdivision works when requested by the Service Provider and the following shall apply:
• A satisfactory final inspection.
• The work-as-executed plans and associated documentation including all test results are submitted, assessed and accepted by Council.
• Written acceptances of other authorities to relevant aspects of the works have been submitted to Council.
• Development Consent conditions relating to the works being satisfied.

It is the Service Provider’s responsibility to obtain Compliance Certificates from any Accredited Certifiers used to certify satisfaction of conditions or aspects of the Development Consent.

Compliance Certificates may be issued for identifiable components or aspects of the development or for compliance with a Development Consent condition.

3.11.2 Local Approvals under the Local Government Act 1993
Where Council has given a local approval in relation to works required under a Development Consent, Council will not normally advise of compliance with that Local Approval specifically, unless requested by the Service Provider.

3.11.3 Maintenance/Defects Period and Bond
The Service Provider remains responsible for remedying defective work up to and throughout the Maintenance/Defects Period. The Maintenance/Defects Period for all Subdivision and Development related works shall be twelve (12) months.

Damage or nuisance arising from defective works including that caused by eroded soils which should have been stabilised as part of the development works shall be rectified during the maintenance period without delay.

The Maintenance/Defects Period will commence upon:
• The satisfactory completion of works as evidenced by the final inspection, excepting any bonded uncompleted works as agreed by Council.
• The payment of the Maintenance/Defects Bond.
• The submission of satisfactory work-as-executed plans, test results and when applicable other Authorities’ written approval of the works.
• Council issue of a Subdivision Certificate where applicable.

A Maintenance/Defects Bond shall be lodged as an unconditional Bank Guarantee with no termination date or cash only.

The value of this Maintenance/Defects Bond shall be in accordance with Council’s current fees and charges or where not covered by the current fees and charges as determined by Council’s Representative.

The Maintenance/Defects Bond is provided to cover any Council incurred costs of abnormal maintenance and/or rectification of any work found to be defective within a period of twelve (12) months from the date of commencement of the Maintenance/Defects Period.
In order to secure release of the Maintenance/Defects Bond it is the responsibility of the Service Provider to arrange an inspection with Council’s Representative approximately four (4) weeks before the end of the Maintenance/Defects Period and to rectify any defects identified at that time or prior to that time.

After one (1) month from the end of the Maintenance/Defects Period or the notification of defects, whichever is the later, Council may expend bond monies to remedy defects and recover any additional costs from the Service Provider.

Council will not expend bond monies without giving fourteen (14) days’ notice to the Service Provider of the intended rectification works. This notice does not apply to emergency maintenance works carried out by Council at any time.

The cost of any emergency remedial work carried out by Council during the Maintenance/Defects Period shall be borne by the Service Provider where the remedial work is the result of a defect.

Any temporary repairs carried out by Council shall be removed and the defect(s) satisfactorily rectified by the Service Provider along with any additional works necessary to prevent any reoccurrence.

Where defects are substantial a further Maintenance/Defects Period and Bond may also be applicable to the completed remedial works as determined by Council’s Representative.

Where there is a delay of greater than two (2) months from the time of issue of a subdivision certificate and registration of a linen plan the maintenance period may be extended by Council’s Representative.

### 3.12 Provision of Utilities

The Service Provider shall make pre-construction arrangements with appropriate Authorities regarding the installation of new infrastructure.

Approved Utility installation diagrams shall be provided for comment to Council’s Representative at the time of construction drawing assessment if diagrams are available at that time or to Council’s Representative if they become available after issue of construction approvals:

The following utilities are normally required:

- Electricity supply including street lighting to roads and other public areas.
- Communication services.
- Gas mains if required by the relevant provider.
- Water supply.
- Sewerage systems.

The Service Provider shall give adequate notice and make satisfactory arrangements with Authorities for the installation of new infrastructure.
All works shall be carried out to the requirements of the relevant Authority and any Council requirements.

Services shall be located within the Council’s footway allocation in accordance with the NSW Streets Opening Conference 2009.

The Service Provider shall be fully responsible for the repair of any damage caused by other Authorities in providing services to a development.

All trenching is carried out to the Utility Authorities requirements. Backfill shall be adequately compacted to the adjacent natural ground condition to prevent subsequent settlement. Road crossings shall be backfilled in accordance with the requirements of this Specification.

Utility infrastructure works shall be completed to enable connections and supply prior to the release of a Subdivision Certificate or an Occupation Certificate.

3.12.1 Existing Utility Services

The Service Provider, subject to their negotiations with the Utility Authority, is responsible for all costs associated with adjustment and protection of existing utility infrastructure.

3.12.2 Works by other Authorities

Some Authorities may wish to have full control over some works by undertaking the works themselves, e.g. traffic signal installation, connections to live water supply.

The Service Provider is responsible for arrangements with the relevant Authority for the co-ordination of these works with their works program.

Council requires written acceptance from the Authorities of the completed works. Acceptance of the works may include the payment of fees, costs or bonds by the Service Provider to those Utility Providers.
Section 4 - Traffic Management

4.1 Requirements

4.1.1 General

The Service Provider shall provide a Traffic Management Plan (TMP) including traffic control plans (TCP) where required for all works that may affect any public place or road where traffic control will be needed regardless of the extent of works being carried out. For all Council controlled roads, the TMP shall be submitted to Council for review and comment, prior to the commencement of any works.

The Service Provider shall satisfy all requirements of the Roads and Maritime Services for roads under the responsibility of the Roads and Maritime Services.

For works affecting road or pedestrian traffic the Service Provider shall apply to Council for a Road Occupancy Licence (ROL), which is available from Council’s website. The ROL shall be accompanied by the aforementioned TMP and TCP.

Approval of the Road Occupancy Licence (ROL) only relates to occupation of the road space, and does not grant permission for, or approval to the actual / physical work being undertaken.

The TMP shall include and address the following issues where relevant. Other site specific issues not included below may also be relevant to the TMP:

- The total area of works showing all existing adjacent features affected by traffic management proposals.
- Identification of the various construction stages resulting in changed provisions for both pedestrian and vehicular traffic.
- Information for all construction stages detailing signposting, barricading, pavement marking, temporary works, etc.
- Design drawings for any temporary roadways and detours showing pavement, wearing surface and drainage details.
- Details of arrangements for construction under traffic.
- Traffic Control Plans (TCP) for during and outside work shifts.
- Vehicle movement plans.
- Special consideration of the safety of pedestrians, cyclists and workers.
- The 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. With confirmation that this has been supplied to the local Police.
- Whether the use of variable message signs (VMS) is required.
- Detour routes
• Heavy traffic congestions resulting in increased travel times. Detours may alleviate congestion and include special purpose strategic signage (eg: variable message signs).

• Any impacts on public transport, local residents & businesses, shopping centres, churches, industrial areas, parking stations, public facilities (eg. Football oval) schools, hospitals, etc.

• In the event of an emergency, or unacceptable levels of congestion, you may be ordered to cease works and restore the road to trafficable condition. The amount of time it would take to do this should be considered and communicated in the TMP.

The Service Provider shall advise all affected parties such as emergency services, waste services, adjacent residents and public transport providers with a minimum of seven (7) days prior to commencement of works. Information provided shall include notification of works and Service Provider contact details.

A Traffic Control Plan (TCP), which may form part of the TMP, must be prepared by a person suitably qualified by Roads and Maritime Services as defined by the Traffic Control at Work Sites manual. The TCP must include the name of the persons preparing the plan along with their level of certified qualification and certificate number.

The TCP must satisfy all the requirements of the current Roads and Maritime Services Traffic Control at Worksites Manual and AS1742.2 Manual of uniform traffic control devices Part 2: Traffic control devices for general use.

The TCP shall include and address the following issues where relevant:

• Types and locations of permanent regulatory (R series) and warning (W series) signs.
• Types and locations of temporary signs (T series) including advance warning signs and variable message signs (VMS).
• Locations of permanent and temporary traffic signals.
• Locations of any required Traffic Controllers.
• Locations and lengths of taper and safety buffer areas.
• Locations of safety barrier systems including end terminals.
• Pedestrians and cyclists paths.
• Locations of entry and exit gates to work areas, individually numbered and signposted.
• Details of access to adjoining properties, car parking areas, and side roads.
• Pavement marking details, including types of delineation required, turning arrows, stop/holding lines and other road markings, types and positions of raised pavement markers and other delineation devices.
• Locations of temporary lighting.
Traffic Control measures shall be installed and maintained by persons appropriately qualified by Roads and Maritime Services. Traffic Controllers shall be persons appropriately qualified by Roads and Maritime Services.

The implementation and ongoing maintenance of traffic control measures are the responsibility of the Service Provider carrying out the works.

If it comes to the attention of Council that Traffic Control Devices (TCD) are insufficient or not operational (particularly in an after-hours situation), then Council may arrange to reinstate the TCD. The cost of any and all such work shall be charged to the Service Provider.

Changes to the accepted TCP shall be carried out by a person suitably qualified as noted above. Council acknowledges that changes to TCPs need to be made from time to time to suit site conditions and work staging. The Service Provider carrying out the works is responsible for making appropriate changes to the Traffic Control Plan and implementing those changes on site.

The Service Provider shall conduct operations so as to offer the least possible obstruction and inconvenience to the public. The length or amount of work under construction at any one time shall not exceed that which can be properly managed having due regard for the rights of the public. Unless otherwise specified or permitted, all traffic (both vehicular and pedestrian) shall be allowed to pass through the works. Signposting and control of the work site shall separate motorists and pedestrians from the workers and machinery.

Other works shall not commence prior to the installation of all traffic management controls as shown on the plans that have been provided by the Service Provider. The Service Provider shall ensure that the required signage, lights, barriers, etc are available for the time works are to commence.

4.1.2 Side Tracks and Working Under Traffic

The Service Provider shall be responsible for the design, construction and operation of any side tracks, detours and working under traffic. These shall be maintained in good condition, removed when works are finished and the area restored in accordance with the approval or contract. The minimum restoration shall be as per preconstruction conditions.

Installation of all sign posting, pavement marking, safety barriers and traffic control devices shall be completed before the opening of side tracks to traffic.

Maintenance of side tracks shall ensure that:

- The road surface and pavement is kept in a sound condition.
- Any potholes or other failures are repaired without delay.
- Signs, markings and delineators remain intact and are clearly visible.
- All temporary lighting functions effectively.

Where construction under or adjacent to traffic is approved:
• Operation and control of obstructions in existing carriageways shall be planned in accordance with the requirements of the current version of Roads and Maritime Services Traffic Control at Worksites Manual.

• The Service Provider shall ensure all carriageways are restored to a safe and trafficable state for through traffic prior to cessation of work each day.

• All permanent sign posting, pavement markings, safety barriers and traffic signals where required shall be completed or reinstated prior to opening completed work to traffic.

4.1.3 Monitoring
The Service Provider shall undertake daily inspection of all TCDs and temporary deviations and detours to ensure all measures are in accordance with their TCP or TMP. These inspections shall include monitoring congestion levels and implementing measures to address unacceptable levels of congestion.

A diary recording of installation dates, operation times, and subsequent removal of temporary speed zones shall be kept by the Service Provider on a daily basis. All changes made to the TCP on site shall be recorded. These records shall be made available to Council’s Representative upon request.

4.1.4 Traffic Incidents
Council’s Representative shall be notified of any traffic incidents that occur within the work site not more than twenty-four (24) hours after the Service Provider becomes aware of the incident.

A Traffic Incident Report shall be prepared by the Service Provider providing full details of the traffic incident. The Traffic Incident Report shall be submitted to Council’s Representative and shall include the following information:

• Time, date and exact location within the work site.

• Weather conditions at the time of the incident.

• TCP in use at the location and time of the incident.

• A written statement that at the time of the incident all traffic control devices were in accordance with the TCP and if not, details of any non-compliance.

• The number of vehicles, pedestrians or workers involved, injuries if any and actions taken by the Service Provider after the incident.
Section 5 - Site Clearing and Bulk Earthworks

5.1 General

5.1.1 Description

This section of the Specification provides required standards for carrying out earthworks for development related works, general road works and subdivision construction.

The works covered by this section of the Specification include requirements for:

- The clearing and grubbing.
- Excavation, including stripping and stockpiling of topsoil.
- Filling.
- Road pavement subgrade preparation.
- Table drains, catch drains and shoulder drains.
- Testing and inspection.

Where this Specification does not cover a particular aspect of the earthworks being constructed requirements of AS3798:2007 – Guidelines on earthworks for Commercial and Residential Developments shall apply. Confirmation of any requirement shall be obtained from Council’s Representative in any case.

The construction of levees, detention basins and walls of temporary sediment basins (if approved) are not covered by this Specification. Specifications for these and similar water retaining works shall be prepared for the site specific conditions by a Consulting Geotechnical Engineer engaged by the Service Provider. Any specification for these works shall include construction of these works to level 1 geotechnical control in accordance with AS3798.

5.1.2 Soil and Water Management, Erosion and Sediment Control

No clearing, grubbing or earthworks shall occur until a Construction Certificate/Engineering plans (incorporating a Soil and Water Management Plan and Erosion and Sediment Control Plan) have been approved by Council’s Representative or the Accredited Certifier and the mandatory Pre-commencement meeting held with the Service Provider, Council’s Representative or the Accredited Certifier.

Soil and Water Management Plans and/or Erosion and Sediment Control Plans shall be prepared in accordance with the requirements of Managing Urban Stormwater: Soils and Construction, 4th Edition, Landcom, 2004 known as “The Blue Book”. The Service Provider shall have a new plan prepared by a suitably qualified and experienced person in accordance with the requirements of “The Blue Book" should Council’s Representative or the Accredited Certifier consider this to be necessary. The new plans shall be subject to acceptance by Council’s Representative or the Accredited Certifier.

All soil and water management and erosion and sedimentation control measures and devices shall be installed and maintained in accordance with the accepted plan and in accordance “The Blue Book".
"Book" and the documents referenced therein prior to and during earthworks and until all rehabilitation and revegetation has been established to Council’s or the Accredited Certifier’s satisfaction.

All earthworks shall be progressively vegetated and/or landscaped in accordance with “The Blue Book” and approved Landscape plans.

Full vegetation shall be established on all areas prior to issue of final acceptance of works, Occupation Certificate and Subdivision Certificate.

It is the Service Provider’s responsibility to ensure soil and water management and erosion and sediment control measures and devices that could cause a danger or risk to workmen and/or the public are appropriately sign posted and or protection works and or barriers have been provided.

### 5.1.3 Preservation of Existing Trees and Native Vegetation

Trees and native vegetation communities outside the approved construction footprint are to be preserved by approved means to prevent the destruction normally caused by placement of conventional filling and by other earthworks within the critical root zone. All works shall be carried out in accordance with AS4970 – Protection of trees on development sites.

Prior consultation with and approval/s from Council’s Representative shall be required before works begin where the project may affect trees. These trees may be within the same property as the project or within the adjoining property.

The Service Provider shall ensure that all trees and other vegetation identified for retention, including important habitat/s, (that may include dead or fallen trees) are not disturbed or removed. When requested from Council’s Representative and/or nominated in the conditions of Development Consent, a Consulting Arborist and/or Ecologist shall be engaged by the Service Provider to provide advice and compliance reporting during the works.

Trees, stands of trees and areas of vegetation which are to be retained shall be fenced off and protected in accordance with requirements specified in documentation that may form part of the approval documentation.

The Service Provider shall plan all operations to ensure that there is no damage to any trees outside the limits of clearing specified on the approved drawing or other approved documentation.

### 5.1.4 Consulting Geotechnical Engineer

The Service Provider shall engage the services of a qualified Geotechnical Engineer to provide advice, testing, supervision and reporting during earthworks as requested by Council’s Representative. The advice of the Geotechnical Engineer, where in conflict with the requirements of this Specification, shall not be implemented until concurrence with the geotechnical engineering advice has been obtained from the Council’s Representative.
5.2 Clearing and Grubbing

5.2.1 General

The Service Provider shall carry out a Dial Before You Dig search prior to commencement of works and the Service Provider shall implement measures to prevent damage to existing underground and overhead utility services.

Locate and mark existing underground services at the site prior to commencement. Locate any survey marks in the area of interest by contacting Survey Services at Land and Property Information prior to commencement or contact other appropriate authority responsible for survey records. If there are survey marks, the Service Provider shall meet all protection and relocation requirements from relevant Authority.

The Service Provider shall implement measures to prevent timber from falling on private property and the Service Provider shall dispose of any timber so fallen or produce the written consent of the owner to its remaining there.

Any trees, branches or vegetation, in the opinion of Council's Representative that are unsound, could become unsound, present a hazard as a result of the works or cause maintenance issues and negative performance of the works, shall be cut down and removed to the satisfaction of Council's Representative.

Damage of any kind, including damage to trees and fencing occurring during clearing operations shall be repaired by the Service Provider to the satisfaction of Council's Representative.

5.2.2 Areas to be Cleared

The areas to be cleared shall be limited to, the areas occupied by the completed road formation, stormwater drainage works, site regrading areas and water reticulation and sewer reticulation works. No other areas shall be cleared unless specifically approved by Council's Representative or shown in the approved drawings.

Unless otherwise detailed on the approved drawings, limits of clearing are defined as lines one (1) metre outside the intersections of excavation or fill embankments with the natural surface.

Service trenches outside the general limits of clearing shall only be under scrubbed. Where slashing of lower shrubs and ground cover is sufficient to permit the works the slashed material shall be retained on site for soil conservation purposes. Alternatively the slashed vegetation may be stockpiled for use in vegetation regeneration works.

Unless otherwise specified, remove all vegetation, logs, stumps, boulders, roots, scrub, debris, dumped material and items within the limits of clearing. Demolish and dispose of any minor man-made structures (such as fences and livestock yards), all rubbish and other materials that are unsuitable for reuse onsite. All natural landscape watercourses and natural rock outcrops shall be undisturbed unless approved by Council's Representatives.
All trees and stumps, on or within the limits of clearing, unable to be felled and removed by the clearing methods used by the Service Provider shall be removed by grubbing. Stumps and roots over 75mm diameter shall be grubbed out to a minimum depth of 0.5m below the natural surface or 1.5m below the finished surface level, whichever is the lower. Backfill grub holes with suitable spoil from excavations compacted in layers to the density of the surrounding undisturbed soil.

5.2.3 Disposal of Cleared Materials
All materials cleared and grubbed, other than those being chipped for reuse, shall be removed from the site.

Sections of felled trees may be required to be retained on site in accordance with Council’s conditional requirements.

5.2.4 Chipping or Grinding of Cleared Vegetation
Cleared vegetation shall be chipped or ground where possible. The chippings may be stockpiled for re-use as mulch in accordance with the approved drawings.

Protection of stockpiles shall be provided to ensure leachate does not contaminate any area.

Each stockpile of chipped or ground vegetation shall be limited in size to 400m$^2$ and 2.5m high.

Excess material that is not to be used on site shall be immediately removed and disposed of at an approved waste management facility or by other lawful means.

5.3 Earthworks Excavation

5.3.1 General
All earthworks excavations shall conform to the lines, grades, cross sections, dimensions and allowances for pavement thicknesses, landscaping requirements and other surface finishes shown on the approved drawings.

All rocks and boulders which protrude above the proposed finished surfaces shall be removed.

Materials obtained from excavations that meet specification requirements for fill material shall be used in the upper layers or filled road subgrades and shall be confirmed by the consulting Geotechnical Engineer for suitability.

Rock surfaces shall be left clean and free of spilled soil or debris.

5.3.2 Stripping and Stockpiling of Topsoil
Earthworks shall commence with the stripping of topsoil within the limits of the area for earthworks including areas on which underground servicing, paving, structures or filling are to be constructed. The depth of stripping shall be to the bottom of the grass roots zone or a depth determined by the Consulting Geotechnical Engineer. Grass shall be stripped together with topsoil.
Soils shall not be stripped from around existing trees closer than a distance equal to twice the distance from the trunk to the drip line without the approval of the Consulting Arborist or Ecologist. In the case that no Consulting Arborist or Ecologist has been appointed, approval shall be obtained from Council’s Representative.

Stockpile locations for topsoil shall be located where shown on the approved drawings. Alternative locations for topsoil stock piles nominated by the Service Provider which are required due to site conditions or staging of works must first be accepted by Council’s Representative before using that location.

Topsoil stockpiles shall not exceed 2.5m in height and have a maximum batter slope of two horizontal to one vertical (2:1).

Erosion and sediment control of soil stockpiles shall be managed in accordance with Section 5.1.2 Soil and Water Management, Erosion and Sediment Control of this Specification.

5.3.3 Disposal of Surplus Material

Surplus material from excavations shall not be disposed of onsite other than in accordance with the approved construction drawings.

Spoil sites shall be cleared and grubbed to the extent necessary before any material is deposited. Strip topsoil as specified above and stockpile for later resspreading over the placed spoil.

On completion of stockpiling, the stockpile site shall be rehabilitated in accordance with the approved Erosion and Sediment Control Plan/Soil and Water Management Plan and to the satisfaction of Council’s Representative.

If suitable disposal areas have not been approved on site, the surplus material shall be immediately disposed to a Council approved site or disposal facility.

5.3.4 Unsuitable Material

The Service Provider shall make available rollers and other plant for the test rolling of stripped surfaces, natural pavement subgrade and floors of excavations/cuttings in the presence of the Consulting Geotechnical Engineer and Council’s Representative or the Accredited Certifier.

Any unsuitable material identified onsite during any stage of the earthworks shall be excavated to the extent recommended by the Consulting Geotechnical Engineer or Council’s Representative. Material removed may be incorporated in to the works elsewhere on the site if that material is approved for its proposed use by the Consulting Geotechnical Engineer or Council’s Representative. If the material is not approved for use elsewhere on the site it shall be removed from site.

Unsuitable material which is removed from below proposed fill areas or from the face of cuttings shall be replaced with fill material confirmed by the Consulting Geotechnical Engineer and approved by Council’s Representative for use as fill material and compacted in accordance with the requirements of this Specification.
Unsuitable material which is removed from below pavement subgrade level shall be replaced with approved select fill material. The material shall be compacted in accordance with the requirements of this Specification for subgrade preparation.

### 5.3.5 Transitions from Excavation Cuttings to Fill

Following the removal of topsoil and before the excavation of any cutting commences the Service Provider shall survey and mark the position of the intersection line between the excavation cutting and fill embankments occurring at the underside of the pavement.

Following excavation to the excavation cutting floor, a terrace shall be excavated for the width of the pavement to a depth of 600mm below and parallel to the cutting floor.

In addition the terrace shall extend into the cut for a distance of 10m from the line resulting from the intersection of the planes of the Designed Floor Level and the stripped surface.

### 5.3.6 Retaining of Excavated Cuttings

Stability of excavated cuttings shall be designed in accordance with Section 5.6 Retaining Wall and Batters of Council’s *Civil Works Specification – Design Guideline*.

Stability of excavated cuttings shall be ensured by:

- Battering to a maximum of four horizontal to one vertical (4:1) slope angle or as recommended by a qualified Geotechnical Engineer, or
- Installation of a retaining structure as designed by a Qualified Civil or Structural Engineer.

Construction of retaining walls shall be inspected and certified by a Qualified Civil or Structural Engineer who is registered on the National Engineers Register (NER), as meeting the requirements of AS4678:2002 – *Earth Retaining Structures*. Certificates and reports confirming the compliance of the construction with the design shall be provided to Council’s Representative.

When there is no retaining wall design, the Service Provider shall design the retaining wall in accordance with Section 5.6 Retaining Walls and Batters of Council’s *Civil Works Specification – Design Guideline*.

### 5.4 Earthworks Filling

#### 5.4.1 General

Filling shall not be placed until clearing and stripping of the area has been test rolled, inspected and the suitability of the proposed fill material has been confirmed by the Consulting Geotechnical Engineer or Council’s Representative.
Filling shall be placed and compacted to conform to the lines, grades, cross sections and dimensions shown on the drawings and to the requirements of this Specification or other requirements as agreed between Council and the Geotechnical Consultant.

Foundations of shallow fill embankments (depth less than one (1) metre from the top of pavement to the natural surface) shall be inspected and tested by the Consulting Geotechnical Engineer or Council’s Representative to determine if the material meets road subgrade requirements.

Material in the foundations for shallow fill embankments which does not meet the requirements for road subgrade requirements shall be removed and replaced by material of the specified quality as recommended and approved by the Consulting Geotechnical Engineer or Council’s Representative.

Foundations for shallow embankments shall be prepared for fill embankment construction after removing topsoil and unsuitable material, by loosening the material exposed to a depth of 200mm, adjusting the moisture content of the loosened material and compacting as required by this Specification. The Service Provider shall use equipment and techniques to minimise surface heaving or other foundation damage.

For all other fill embankments the foundation shall be prepared by grading and levelling the general area, adjusting the moisture content where necessary and compacting the top 200mm as required by this Specification.

Where filling is to be placed on hillsides or against existing fills with slopes which are less than ten horizontal to one vertical (10:1), the slope shall be roughened across the slope to allow placement of filling in layers and to prevent slip failures at the interface.

Where filling is to be placed on hillsides or against existing fills with slopes which are greater than ten horizontal to one (10:1), benching shall be constructed prior to the placement of filling. No fill shall be placed until benching has been inspected and confirmed as suitable by the Consulting Geotechnical Engineer and/or Council’s Representative. If fill is placed on a surface with slopes steeper than 4H:1V, bench the surface to form a key for the fill. As each layer of fill is placed, cut the existing ground surface progressively to form a series of horizontal steps greater than 1m in width and greater than 100mm deep. Re-compact the excavated material as part of the filling. Shape to provide free drainage.

Where a lot is to be filled in isolation, the toe of the batter shall merge with the existing surface a minimum of 1m from the adjoining property boundary and within the approved development site unless otherwise approved.

All inspections and testing shall conform to Level 1 inspection and testing of AS3798:2007 – Guidelines on earthworks for Commercial and Residential Developments.

5.4.2 Retaining of Fill

Fill shall be retained by either:

- Stabilised batters to slopes recommended and designed by the Consulting Geotechnical Engineer, approved by Council’s Representative and accepted by Council’s Representative; or
• As shown on the approved construction drawings in accordance with the Consulting Geotechnical Engineer’s recommendations; or
• By the installation of retaining walls.

Stability of fill shall be ensured by:
• Battering to a maximum of four horizontal to one vertical (4:1) slope angle or as recommended by a qualified Geotechnical Engineer; or
• Installation of a retaining structure as designed by a Qualified Civil or Structural Engineer.

All completed fill batters shall be inspected and confirmed to have been stabilised in accordance with the recommendations by the Consulting Geotechnical Engineer and approved by Council’s Representative.

Construction of retaining walls shall be inspected and certified by a Qualified Civil or Structural Engineer who is registered on the National Engineers Register (NER), as meeting the requirements of AS4678:2002 – Earth Retaining Structures. Certificates and reports confirming the compliance of the construction with the design shall be provided to Council’s Representative.

When there is no retaining wall design, the Service Provider shall design the retaining wall in accordance with Section 5.6 Retaining Walls and Batters of Council’s Civil Works Specification – Design Guideline.

5.4.3 Filling of Verges
Verges shall be finished true to design levels and the surface raked smooth and free of all rubble, stones, sticks or other such matter. Rocks within verges shall be removed to a depth of 100mm below finished surface level and the verge topsoiled with an approved fill such as a clay/loam material containing less than 40% clay. Minimum thickness of topsoil shall be 100mm.

Fill containing rock greater than 40mm diameter or clay lumps will not be permitted within 600mm of the finished surface within the verge.

5.4.4 Lot Filling
All lot filling shall be undertaken in accordance with AS3798:2007 – Guidelines on earthworks for Commercial and Residential Developments.

The Consulting Geotechnical Engineer shall supervise, inspect and carry out all testing and monitoring of lot filling employing a “Level 1” inspection and testing regime in order to achieve a desirable lot classification in accordance with AS2870:2011 – Residential Slabs and Footings.

Relative compactions requirement will conform to the requirements of Table 5.1 Earthworks Relative Compaction Requirements below.

The aforementioned criteria shall apply to all filled lots including lots presenting as a “P” Classification.
Regardless of the final achievable lot classification, all lot filling shall be compacted to provide ongoing support for ancillary works to buildings and services. This requirement shall be confirmed by the Consulting Geotechnical Engineer and included in the final report.

Road fill batters that extend into lots are considered lot fill under this clause.

A final Geotechnical report including (but not limited to) compaction test certificates, proof rolling verification, lot classifications and recommendations for the minimum foundation requirements required for future buildings of each lot in accordance with AS2870:2011 – Residential Slabs and Footings shall be submitted to Council’s Representative or the Accredited Certifier prior to the issue of the Subdivision Certificate.

5.4.5 Fill Material – General

All fill material shall be a sound, clean, generally homogenous material, free from large rocks, stumps, organic matter and other undesirable material. All proposed fill material shall require prior approval from a Geotechnical Engineer or Council’s Representative for its intended use.

Suitable fill materials shall firstly be obtained from excavations on the site. Imported material shall only be used when the site material is of an unsuitable nature for the intended fill or the quantities obtained from the site are not sufficient. The Service Provider shall be required to manage and sort the materials obtained from excavations to ensure that the best available material is used in locations that require higher quality material, such as road embankments.

Rock material shall be broken down and evenly distributed through the fill material. Individual rocks shall not be larger than two thirds of the layer thickness. Sufficient fine material shall be placed around the larger material as it is deposited to fill the voids and to produce dense and adequately compacted filling. Any rocky patches with insufficient fine material to fill the voids shall be reworked with additional fine material being blended.

5.4.6 Imported Fill Material

Natural materials imported for filling from an offsite source shall be certified by a qualified Geotechnical Engineer as being Excavated Natural Material (ENM) or Virgin Excavated Natural Material (VENM). Certificates shall be provided to Council’s Representative, the Accredited Certifier or any other Authority upon request.

Materials with a resource recovery exemption as issued by the Environmental Protection Authority will also be accepted for imported filling subject to documentation of the exemption being provided to Council’s Representative prior to its use and endorsement by the Consulting Geotechnical Engineer that the material is suitable for the proposed purpose.

5.4.7 Approved Fill / Backfill

Approved fill/backfill shall be defined as fill material including sand, soil or broken rock obtained from site excavations or approved borrowed areas remote from site.
Such material shall:

- Have maximum Plasticity Index of 20 in that fraction passing 0.425mm sieve.
- Be free of material greater than 150mm in size.
- Contain less than 2% organic matter.
- Be capable of being brought to a moisture content suitable for compaction as specified elsewhere herein.
- Have a CBR value in excess of 10% when tested in accordance with Roads and Maritime Services Test Method T117 following a minimum of ten (10) days soaking and the fraction passing 19mm AS sieve.

Approved fill/backfill material obtained shall only be imported from sites having the necessary development approvals to operate, or from such sites where the Service Provider has approved plans.

5.4.8 Selected Fill / Backfill

Select fill/backfill shall meet the requirements of approved fill/backfill with the exception that it shall:

- Be free of material greater than 75mm in size.
- Have a CBR value in excess of 20% when tested in accordance with Roads and Maritime Services’ Test Method T117.

5.4.9 Compaction of Fill Material

Fill material shall be placed and compacted in uniform layers of thickness appropriate to the nature of material and the compaction equipment being used. Layers shall extend for the full width of embankments and shall be placed in horizontal layers. Fill material shall be compacted in a minimum 150mm layer uncompacted thickness. However, greater thicknesses up to 300mm will be permitted subject to the ability of compaction equipment to achieve specified densities in that location.

Each layer shall be compacted to the appropriate density prescribed in this Specification. Where an area is to be planted or grassed, the top 300mm of the filling shall be compacted to a level not exceeding 95% of the standard maximum dry density.

The moisture content of filling material shall be adjusted by the Service Provider to a level that allows specified densities to be achieved quickly and without excessive effort or compacting of the material. The Service Provider shall seek advice from the Consulting Geotechnical Engineer in regards to appropriate moisture content for compaction if problems are experienced in achieving the specified densities.

Rain affected material shall be reworked to provide the required density. Any dispute over the requirement for reworking shall be resolved by demonstration of minimal movement during proof rolling and retesting for density and moisture content.
5.4.10 Backfilling of Structures

No filling shall be placed against concrete bridge abutments, wing walls or retaining walls within 28 days of casting or if the 85% design strength has been achieved, unless advice from the designing and certifying Engineer for the structure otherwise allows. Fill shall be placed and compacted to avoid unbalanced loading or movement of the structure.

Unless otherwise detailed on the approved Construction drawings, the abutments and wing walls of bridges shall be back filled with a select material in accordance with this Specification. Filling outside this area shall be in accordance with other filling requirements in this Specification.

Material placed adjacent to weepholes must be clean, graded, hard and durable crushed stone or river gravel, wrapped in a geotextile, conforming to the following requirements:

- Maximum particle dimension of 53mm and
- No more than 5% by mass passes the 9.5mm AS sieve.

5.4.11 Geotextiles, Geogrids or Similar

Geotextile fabric, geogrids or the like used in conjunction with filling shall be in accordance with recommendations provided by a Consulting Geotechnical Engineer as shown on the approved drawings and specifications. These recommendations shall include materials specification and placement requirements.

5.5 Road Pavement Subgrades

5.5.1 Subgrade Level

Subgrade level shall be the level that allows the approved design pavement to be constructed on top of the subgrade to achieve the approved finished design levels.

All subgrades shall be compacted, graded and trimmed parallel to the designed surface grade and crossfall. The subgrade shall be trimmed to a level of not more than 0mm above or 50mm below the design subgrade level.

5.5.2 Subgrade Assessment

The Consulting Geotechnical Engineer or Council’s Representative shall inspect all subgrades when earthworks have progressed to a stage where the nature of subgrade material can be assessed. The Consulting Geotechnical Engineer shall review the pavement design at this stage and arrange for further CBR and other relevant testing if subgrade conditions do not reflect the subgrade condition that the pavement design was based on. The Consulting Geotechnical Engineer shall confirm in a report to be provided to Council’s Representative or Accredited Certifier that the subgrade as inspected was suitable for construction of the pavement as designed. If this confirmation cannot be provided then further recommendations on the treatment of the subgrade or changes to the pavement design must be made and submitted to Council’s Representative for acceptance prior to any continuation of the pavement works.
Rain affected subgrade material shall be reworked to provide the specified density. Any dispute over the requirement for reworking shall be resolved by demonstration of minimal movement during proof rolling and retesting for density and moisture. No further pavement works shall proceed until rain affected areas have been confirmed by the Consulting Geotechnical Engineer and accepted by Council’s Representative as being suitable.

5.5.3 Subgrades in Cut

All material in the subgrade surface shall be ripped, loosened and compacted to a minimum depth of 150mm below the design subgrade level for the width of the pavement to 150mm behind back of kerb. The maximum dimension of particles in the ripped or loosened zone shall not exceed 100mm after compaction.

After ripping, loosening and compacting the subgrade shall be trimmed parallel with the finished wearing surface so that their levels do not vary from the designed floor levels by more than the tolerances specified above.

All unsuitable material, as determined by the Consulting Geotechnical Engineer or Council’s Representative shall be removed and replaced with approved material and compacted to the required density and any specific geotechnical advice arising as a result of onsite investigations and inspections at the time of excavation.

5.5.4 Subgrade Replacement

Subgrade replacement layers shall be placed and compacted to achieve densities and moisture contents specified for subgrades. Materials to be used for subgrade replacement shall be in accordance with the approved pavement design and confirmed as being suitable by the Consulting Geotechnical Engineer or Council’s Representative.

The completed subgrade or subgrade replacement shall extend a minimum of 150mm behind the rear of the proposed kerb.

The excavation floor or natural surface below subgrade replacement material shall be prepared, compacted and trimmed as specified for subgrades.

5.5.5 Rock Subgrade

Rock at subgrade level shall be thoroughly ripped to a minimum depth of 300mm below the subgrade level and shall as a minimum extend to the sides of the formation to provide drainage away from the pavement. Ripped material shall conform to the size requirements described for fill material. Ripped material shall be compacted to form the subgrade construction layer unless the ripped material is deemed unsuitable for the subgrade. CBR tests may be required on the ripped material should the material be considerably different in nature to assumed subgrade condition.

5.5.6 Filled Subgrades

Material used in the top 150mm below road pavement subgrade level shall be free of particles larger than 75mm, conforming to the requirement of Select Fill material. Material used from 150mm to 600mm below road pavement subgrades shall be free of particles larger than 150mm,
conforming to the requirement of Approved Fill material. Material used from 600mm to 1.0m below road pavement subgrade shall be free of particles larger than 300mm. In any case, the maximum particle size shall be two thirds of the layer thickness.

5.5.7 Clay Subgrades

Clay materials, which are moderate to highly expansive, should have a moisture content between 90% and 110% of optimum moisture content for standard compaction when being compacted. To prevent drying out and to limit possible surface heave, clay subgrades shall be covered by the first select fill or pavement layer as soon as practical after compaction and moisture testing has been confirmed.

5.5.8 Unsuitable Subgrade Material

Subgrade materials may be deemed as unsuitable for placement of pavement material over the subgrade surface at any stage up to including the final trimming compacting and compaction testing of the subgrade surface. Subgrades may be deemed unsuitable by the Consulting Geotechnical Engineer or Council’s Representative. Treatment of the unsuitable subgrade shall be recommended by the Consulting Geotechnical Engineer and accepted by Council’s Representative.

5.5.9 Services Trenching in Subgrades

Trenches for services shall be excavated when earthworks have reached finished subgrade level unless otherwise by Council’s Representative. Trench dimensions shall be in accordance with Section 6.3.5 Trench Dimensions, and Section 7 - Utility Services Installation, Road Opening and Utility Restorations of this Specification.

Compaction tests shall be undertaken to confirm that the trench has been compacted to the subgrade compaction requirements.

5.6 Earthworks Drainage

5.6.1 Table Drains

This clause normally applies to non-urban roads or the side of an urban road opposite the kerb and gutter in construction designated "Half Width Road Constructions".

Table drains shall be aligned and graded parallel to the shoulders of the roadway, and shall be constructed to conform to the requirements of Austroads Guide to Road Design Part 5B: Drainage – Open Channels, Culverts and Floodways and particularly Section 2.13.

Unless otherwise shown on the Drawings or directed by the Principal, line open drains with:

- Organic fibre mat and vegetation, where the longitudinal grade of the completed drain is between 1% and 5% inclusive; or
- Concrete, where the longitudinal grade of the completed drain is less than 1% or greater than 5%.
Concrete lining must have a minimum compacted thickness of 100mm measured at right angles to the surface of the lining, and must be colour matched with that of its surroundings, unless otherwise by Council’s Representative.

5.6.2 Catch Drains
Catch drains shall be provided at the top of cuttings with:

- A cross section not less than 300mm deep and at least 300mm wide.
- Side slopes not steeper than the batter of adjacent road cutting.
- Minimum 1% grade to ensure a free flow of water.
- Minimum distance of one (1) metres from the edge of cutting, and no further away than necessary to maintain fall for the drain.

The cutting of catch drains shall be carried out before or during excavation for the roadway.

Where trees occur in the line of a drain, the drain may be neatly diverted.

Outlet drains shall be provided to direct catch drains into drainage structures or water courses. Outlet drains leading down slopes and batters shall be constructed to minimise scour.

5.6.3 Shoulder Drains
Shoulder drains are provided to drain the subgrade through the shoulder to prevent pavement saturation.

The pavement boxing shall be drained by cutting the shoulder at sags in the longitudinal grade and at locations directed by Council’s Representative.

Shoulder drains shall be cut at an angle of sixty (60) degrees with the road centre line on grades steeper than three (3) per cent, and at right angles to the road centre line on grades up to three (3) per cent, and shall be of depth equal to the depth of the boxing and 200mm wide, and shall be evenly graded to a free outfall. Each drain shall be firmly packed with clean, durable stone of mixed gauges not exceeding 75mm gauge free from material passing a 25mm screen.

5.7 Earthworks Compliance Testing
5.7.1 Compaction Testing Requirements
A Geotechnical Inspection and Testing Authority (GITA) shall be employed by the Service Provider to carry out all testing and inspecting required confirming earthworks compliance with this Specification and any other specification required by the Consulting Geotechnical Engineer. A “Level 1 Inspection and Testing” regime as described in Section 8 of AS3798:2007 – Guidelines on Earthworks for Commercial and Residential Developments is required. The Authority shall hold a current National Association of Testing Authorities (NATA) registration for the relevant tests. All test results certificates/reports shall be forwarded to Council’s Representative.
Copies of the test certificate reports shall clearly describe:

- The date the test was taken,
- The location and layer or level of each test,
- The compaction conformance requirement of this specification,
- If the test is a retest and what test it is a retest of,
- All other information as required by NATA.

Compaction compliance requirements for work carried out under Section 5 - Site Clearing and Bulk Earthworks of this Specification are itemised in Table 5.1 below.

A successive layer of earthworks fill shall not be commenced until the underlying layer has proved to be conforming to this Specification as determined by testing.

All compaction testing shall be carried out in accordance with the “Method of Testing” Section of AS3798:2007 – Guidelines on Earthworks for Commercial and Residential Developments. Lot filling shall be in accordance with the “Compaction Criteria” Section of AS3798. The Compaction Criteria for all other earthworks shall be in accordance with Table 5.1.

### Table 5.1 Earthworks Relative Compaction Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum density ratio (at standard compaction)</th>
<th>Minimum density index (Cohesionless Soils)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backfilling of grub holes</td>
<td>95%</td>
<td>70%</td>
</tr>
<tr>
<td>Replacement of unsuitable material in cuttings other than subgrades</td>
<td>95%</td>
<td>70%</td>
</tr>
<tr>
<td>Replacement of over excavated material</td>
<td>95%</td>
<td>70%</td>
</tr>
<tr>
<td>General fill and foundation of embankments</td>
<td>95%</td>
<td>70%</td>
</tr>
<tr>
<td>Top 0.3m of road embankments or 0 to 0.3m below subgrade</td>
<td>100%</td>
<td>75%</td>
</tr>
<tr>
<td>Backfill within 2m of structures</td>
<td>100%</td>
<td>75%</td>
</tr>
<tr>
<td>Replacement of unsuitable subgrade material</td>
<td>100%</td>
<td>75%</td>
</tr>
</tbody>
</table>
Notes on Table 5.1: At the time of relative density testing moisture contents are to be 60% to 90% of optimum for standard compaction except for moderately to highly expansive clays which shall be 90% to 110% of optimum for standard compaction.

5.7.2 Proof Rolling of Subgrades

In addition to the required compaction testing, road pavement subgrades shall be proof rolled in the presence of the Geotechnical Consultant, Council’s Representative, or the Accredited Certifier.

The roller shall be capable of generating sufficient loading as recommended by the Geotechnical Consultant.

5.7.3 Earthworks Level Tolerances

Before the placement of covering materials and on completion of cutting, filling and all incidental operations, the finished surfaces shall conform to the tolerances in level and shape as itemised in Table 5.2 below.

Testing of earthworks tolerances in terms of levels is to be carried out by a Registered Land Surveyor, exemption to this requirement may be provided by Council’s Representative. The results of levels taken to confirm level tolerance shall be presented on the work-as-executed drawings.

Testing of earthworks for straightness shall be carried out by the Service Provider in the presence of Council’s Representative at a time suitable for Council’s Representative to attend the site.

<table>
<thead>
<tr>
<th>Item</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut subgrade</td>
<td>Level: 0mm above design and 50mm below design</td>
</tr>
<tr>
<td></td>
<td>Straightness: 20mm maximum departure from 3m straight edge both ways</td>
</tr>
<tr>
<td>Fill subgrade</td>
<td>Level: 0mm above design and 50mm below design</td>
</tr>
<tr>
<td></td>
<td>Straightness: 20mm maximum departure from 3m straight edge both ways</td>
</tr>
<tr>
<td>Unpaved areas in cut or fill</td>
<td>Level: ± 15mm in existing road verges</td>
</tr>
<tr>
<td></td>
<td>Level: ± 25mm in subdivision road verges</td>
</tr>
<tr>
<td></td>
<td>Level: ± 100mm in batters</td>
</tr>
<tr>
<td>Lot regrade areas</td>
<td>Level: ± 100mm</td>
</tr>
</tbody>
</table>

5.7.4 Test Method for Compliance

Test methods used for the determination of compaction compliance shall be in accordance with Section 7 of AS3798:2007 – Guidelines on Earthworks for Commercial and Residential Developments. Field densities are to be determined by “Direct” methods. Approval of “indirect”
methods to determine field densities will be considered following a submission to Council’s Representative from the Geotechnical Consultant and/or the Geotechnical Testing and Inspection Authority detailing the use of the method and correlations with backfill materials.

### 5.7.5 Frequency of Testing

The frequency of testing shall be in accordance with Table 5.3 below. If Table 5.3 does not cover a particular situation the Consulting Geotechnical Engineer or Council’s Representative shall specify the required frequency of testing.

**Table 5.3 Earthworks Methods and Frequency of Testing**

<table>
<thead>
<tr>
<th>Characteristic Analysed</th>
<th>Test Method for Compliance</th>
<th>Frequency of Testing whichever requires the most tests: (minimum of 1 test per isolated area in any case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compaction and moisture content of general fill material outside of lot areas</td>
<td>See 5.7.4</td>
<td>1 per layer per 1000m² or 1 test per 500m³</td>
</tr>
<tr>
<td>Compaction and moisture content of fill on lot areas for depths in excess of 300mm</td>
<td>See 5.7.4</td>
<td>In accordance with Table 8.1 in AS3798:2007</td>
</tr>
<tr>
<td>Compaction and moisture content of fill material in footpaths areas (kerb line to boundary or proposed boundary)</td>
<td>See 5.7.4</td>
<td>1 test per 500m² per layer or 1 test per 50 linear metres per layer</td>
</tr>
<tr>
<td>Compaction and moisture content of backfill to structures; replacement of unsuitable subgrade; replacement of unsuitable foundation or other confined operations</td>
<td>See 5.7.4</td>
<td>1 test per 100m³ distributed evenly throughout full depth and area or 1 test every layer</td>
</tr>
<tr>
<td>Compaction and moisture content of top layer of fill (subgrade); cut subgrade and foundation of shallow fill</td>
<td>See 5.7.4</td>
<td>1 test per 500m² or 1 test per 50 linear metres</td>
</tr>
<tr>
<td>Compaction and moisture content of foundation for fill embankments other than shallow fill embankments</td>
<td>See 5.7.4</td>
<td>1 test per 2000m² per layer or 1 test per 200 linear metres</td>
</tr>
<tr>
<td>Material properties - CBR of fill and cut subgrade</td>
<td>AS1289.6.1.1</td>
<td>1 per 800m² where subgrade does not reflect design assumptions</td>
</tr>
</tbody>
</table>
## Characteristic Analysed

<table>
<thead>
<tr>
<th>Test Method for Compliance</th>
<th>Frequency of Testing whichever requires the most tests: (minimum of 1 test per isolated area in any case)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level tolerances of cut and fill batters not associated with roads</td>
<td>Level and co-ordinated position by Registered Land Surveyor</td>
</tr>
<tr>
<td>Straightness of subdivision road verges</td>
<td>3m straight edge</td>
</tr>
<tr>
<td>Level tolerances of cut subgrade and fill subgrade</td>
<td>Level and co-ordinated position by Registered Land Surveyor</td>
</tr>
<tr>
<td>Compaction requirements of service trenches greater than or equal to 300mm wide in road subgrades</td>
<td>See 5.7.4</td>
</tr>
<tr>
<td>Straightness of cut and fill batters</td>
<td>3m straight edge</td>
</tr>
<tr>
<td>Straightness of subgrade</td>
<td>3m straight edge</td>
</tr>
</tbody>
</table>

### 5.7.6 Determination of the Location of Field Compaction Tests and Field Sampling

For all Earthworks testing the Geotechnical Inspection and Testing Authority (GITA) shall determine the location where sampling and testing will be taken independently of any advice or request by the Service Provider(s) responsible for the earthworks. Any evidence of tests and sampling locations being determined by the GITA in collaboration with the Service Provider(s) responsible for the earthworks shall be deemed as non-complying tests. In this case a new set of tests shall be required to be carried out in locations nominated by Council’s Representative.

### 5.7.7 Non-complying Earthworks and Retesting Requirements

#### 5.7.7.1 General

A non-compliance report shall be submitted to Council’s Representative for any non-complying works for which the Service Provider is requesting acceptance. This report shall contain information in support of the request. Work shall not proceed further on any non-complying item until Council’s Representative has considered the non-compliance and approved the works to proceed.
5.7.7.2 Non-complying Tolerances

For non-complying tests for straightness, the Service Provider shall immediately rectify the non-compliance and retest the entire area of rework prior to covering up of the subject area.

The Service Provider shall confirm with the Registered Land Surveyor that the levels fall within the compliant tolerances. If the level tolerances are non-compliant, the Service Provider shall rectify the non-compliance and have the Registered Land Surveyor re-level the entire area of rework prior to covering up. All complying levels shall be confirmed on the work-as-executed drawings prepared by the Registered Land Surveyor.

5.7.7.3 Non-complying Relative Compaction Test Results and Retesting Requirements

Where compaction does not comply on the basis of an inspection or test results the Service Provider shall rework the layer tested in an area in accordance with the following:

- **Lot fill**
  Rework and retest as required by the Consulting Geotechnical Engineer and/or the Geotechnical Inspection and Testing Authority (GITA).

- **General fill (outside lot areas)**
  An area of 1000m² evenly surrounding the failed test location shall be reworked. A retest in the failed test location plus an additional test in the rework area will be required.

- **Verge area fill**
  Rework 25m either side of the failed test location for the full width of the kerb to boundary or proposed boundary. A retest in the failed test location plus an additional test in the rework area will be required.

- **Backfill to structures, isolated replacement of unsuitable subgrade, replacement of unsuitable foundation or other confined operations**
  Rework total area. One retest anywhere in the reworked area.

- **Top layer of subgrade(cut or fill) and foundation of shallow fill (<1m)**
  Rework 25m either side of failed test location for the full width of the subgrade or 500m² surrounding the fail test location in the case of shallow fill foundation. A retest in the failed test location plus an additional test in the rework area will be required.

- **Foundations for fill embankments other than shallow fill embankments**
  An area of 2000m² evenly surrounding the failed test location shall be reworked. A retest in the failed test location plus an additional test in the rework area will be required.

Areas shall not be accepted as complying for compaction until the test results from the retests and additional tests required above confirm compliance.
Section 6 - Stormwater and Subsurface Drainage Construction

6.1 General

Works covered by this section of the Specification include construction of all piped and box culvert stormwater drainage and subsurface drainage. The construction of open earth drains shall be in accordance with the requirements for earthworks in Section 3 – Site clearing and bulk earthworks.

6.2 Acceptable Materials for Stormwater Pipes and Box Culverts

6.2.1 General

All stormwater drainage conduits that are to become Council’s asset following completion of the works shall be any of the following:

- Reinforced concrete pipe (RCP) minimum 375mm diameter with rubber ring joints.
- Fibre reinforced cement pipe (FRC) minimum 375mm diameter with rubber ring joints.
- Polypropylene pipes (PP) maximum 600mm diameter with rubber ring joints.
- Reinforced concrete box culverts (RCBC) minimum 600mm x 300mm internal dimensions with cast in situ or precast base slabs.

Fully cast in situ box culverts may be approved for construction. Full construction specification and details shall be provided on the construction drawings and approved by Council’s Representative.

Conduit systems that are not to become Council’s responsibility for maintenance, including interallotment stormwater drainage may be:

- RCP of any size with rubber ring joints.
- FRC of any size with rubber ring joints.
- Polyvinyl chloride (PVC) pipes maximum 300mm diameter.
- Interallotment pipe to be rubber ringed.
- PP maximum 600mm diameter with rubber ring joints.
- RCBC.

6.2.2 Pipes

RCPs shall comply with the requirements of AS4058:2007 – Precast Concrete Pipes. RCPs shall be of the class detailed on the approved drawings.

FRC pipes shall comply with the requirements of AS4139:2003 – Fibre reinforced concrete pipes and fittings. FRCs shall be of the class detailed on the approved drawings.
PVC pipes shall comply with the requirements of AS1260:2009 – PVC-U pipes and fittings for drain, waste and vent application and AS1254:2010 – PVC-U Pipes and Fittings for Stormwater or Surface Water Applications as applicable. 100mm diameter PVC pipes shall be Class SN6 to AS1260, solid walled, solvent welded. PVC pipes larger than 100mm diameter shall be Class SN8.

Polypropylene pipes (PP) shall comply with the requirements of AS5065:2005 – Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications.

Use of rubber ring joints with all pipes shall comply with the requirements of AS1646:2007 – Elastomeric seals for waterworks purposes.

Cutting of pipes on site shall only be carried out by a method that is specified or acceptable to the manufacturer and Council’s Representative.

### 6.2.3 Precast Reinforced Concrete Box Culverts

Precast reinforced concrete box culverts (RCBC) shall comply with the requirements of AS1597 – Precast reinforced concrete box culverts.

Starter bars, where required, shall be cast into or set into units with an epoxy binder specifically made for this purpose where specified on the approved construction drawings.

Any penetrations required in precast RCBC units required to connect stormwater drainage pipes shall be provided in the precast unit at the time of manufacture. Any modifications or penetrations required to box culvert units after delivery to site shall be approved and certified by the manufacturer. The certification shall state that the design adequacy of the precast unit will not be affected in any way by the modification.

### 6.2.4 Compliance Documentation for Supplied Pipes and Box Culverts

The Service Provider, when requested by the Accredited Certifier or Council’s Representative shall obtain copies of test certificates and any other documentation that may be required to verify that the supplied stormwater pipes and/or box culverts comply with the specified standards.

### 6.3 Trench Excavation and Bedding

#### 6.3.1 General

All conduits shall be laid in trench conditions except where otherwise specifically shown on the approved drawing. This may require the completion of filling earthworks in the area of the trench prior to trench excavation. The requirement to complete filling to finished surface levels or road pavement subgrade level may be relaxed with the approval of Council’s Representative where conduits are located in deep fill embankments.

Pipes, if shown on the approved drawings, shall be laid under embankment conditions and laid in accordance with full details to be provided by the designing Engineer or a suitably qualified Engineer engaged by the Service Provider. The details shall be submitted to Council’s Representative for acceptance prior to construction.
The Service Provider shall set out the trench alignment clearly marking the specified end points, changes in directions and pit locations with pegs and stakes. The depth to invert shall be clearly marked on the stakes for all stormwater drainage construction.

All trench alignments shall be cleared and/or stripped of topsoil prior to commencing trench excavation in accordance with Section 5 - Site Clearing and Bulk Earthworks.

6.3.2 Trenches across Road Reserves

Where it is necessary to construct drainage across road reserves refer to Section 7 - Utility Services Installation, Road Opening and Utility Restorations of this Specification.

Where final surfacing of the trench will not be carried out immediately following backfilling, a temporary surface consisting of cold mix asphaltic concrete shall be installed and maintained in a trafficable and safe condition by the Service Provider until final surfacing can be installed. As a minimum, temporary cold mix asphaltsurfacing shall be installed so as to form a slight raised hump to allow for compaction by traffic. The Service Provider shall monitor the performance of the cold mix installed and if the surface level of the cold mix compacts so as to create a step of more than 20mm to the top of the existing pavement level the Service Provider shall add more cold mix as appropriate.

Final surfacing shall overlap existing pavement material by a minimum of 300mm either side of the trench wall. The line were the new surfacing matches the existing surfacing shall be saw cut parallel to the line of the trench.

6.3.3 Trench Floors

Trenches shall be excavated to the depths and widths specified to allow installation of conduits, pipes or box culverts to the line, levels, grade, and cover specified on the approved drawings. A uniform fall to the discharging end of the pipelines or box culverts shall be achieved in the trench floor.

Unsuitable material which includes soft soils, irregular or fragmented rock and saturated soil, shall be removed from the trench invert and replaced with compacted granular material to provide uniform support.

Where rock is encountered for the full formation area it shall be neatly excavated to the underside of the bedding material.

Where rock is found in an isolated section of trench floor it shall be removed and replaced with compacted granular material to a depth of 300mm below the base of the bedding layer.

Over excavation or uneven surfaces in rock foundations shall be corrected with mass concrete to provide a uniform surface at least 50mm above the highest points of rock.

For pipes with sockets protruding beyond the barrel outside surface, chases shall be cut into the bed of the foundation as necessary, in the appropriate positions, so that each pipe is supported along the full length of the barrel and the socket is not subjected to point loading.
For all box culverts, the trench floor or foundation shall be inspected by Council's Representative and where considered necessary the Consulting Geotechnical Engineer shall confirm that adequate bearing capacity exists for support of the box culvert structure. The Consulting Geotechnical Engineer’s confirmation of adequate bearing capacity shall be documented in a report and submitted to the Council’s Representative.

The foundations shall be compacted so that the relative compaction as determined by Roads and Maritime Services test method T166 Relative Compaction of Road Construction Materials is not less than 95% for standard compaction effort.

6.3.4 Surface Restoration

Where the excavation of trenching has removed and/or disturbed an existing surface, that surface shall be reinstated with new materials to the requirements of Section 7 - Utility Services Installation, Road Opening and Utility Restorations and Section 15 - Restoration and Finishing of Surfaces.

6.3.5 Trench Dimensions

Trench dimensions and conditions for pipe, conduit or box culvert installation shall generally be in accordance with the requirements of:

AS3725 – Design for Installation of Buried Concrete Pipes.
AS2566 – Buried Flexible Pipelines.
AS2032 – Installation of PVC Pipe Systems.
AS1597 – Precast Reinforced Concrete Box Culverts.
Council’s Civil Works Specification – Standard Drawings

The standard width of trenches for subsurface drainage shall be 300mm.

The width of trenches for curved pipelines shall be adequate to allow correct jointing of rubber ring jointed pipes while providing the minimum clearances from the pipe to the trench walls as required by the above standards.

For box culverts the trench width shall be the width of the culvert base slab plus minimum 150mm each side.

Trench excavation shall include the required depth to achieve minimum bedding thickness.

6.3.6 Pipe Cover

Pipes of the type and class shown on the approved drawings shall be used and laid to the invert levels as shown on those drawings except where the design invert level nominated on the drawings does not provide sufficient cover for either the class of pipe being used or to enable works above the pipe to be completed without encroachment of the pipe into those works. Should this occur the pipes shall not be laid and the Contractor shall seek clarification or further advice from Council’s Representative.
The cover provided at property access should where possible meeting the requirements as specified above, but a reduction in the cover may be acceptable following approval from Council’s Representative.

The requirements of AS3725:2007 – Design for Installation of Buried Concrete Pipes shall be satisfied for cover, load, pipe class and bedding in relation to reinforced concrete (RC) or fibre reinforced concrete (FRC) pipes.

Cover for all other pipes types shall be in accordance with the requirements of AS2566 – Buried flexible pipelines or AS2032:2006 – Installation of PVC Pipe Systems. In any case the standard or the requirement providing the largest cover shall be used.

6.3.7 Protection and Drainage of Works

The Service Provider shall provide for the diversion and control of stormwater during construction of stormwater drainage. Where trenches cannot be drained by gravity, the Service Provider shall provide pumping equipment to keep the excavation dewatered and the discharge shall be located and controlled so as not to cause erosion or damage to the environment.

Concurrence of Council’s Representative is required for the construction of any temporary damming or diversions of watercourses or drains entering or passing through the works site. Council’s Representative may require the submission of a Geotechnical Engineer’s design or limit the period that the temporary dam or diversion may stay in place and impose other conditions or requirements relevant to the particular case. Approvals from other Authorities may also be required.

Where compaction of backfill is required and the trench has been externally dewatered, the dewatering equipment shall remain operating until the compaction of the trench backfill has been completed.

If any material in the trench excavation has been damaged by water, it shall be removed and replaced with suitable backfill material. If any excavated material has been excessively moistened by uncontrolled inflowing water, or has been contaminated, the material shall be removed from the work site and replaced with suitable backfill material.

Water in trenches shall be lowered to the bottom of the trench during bedding, pipe laying and backfilling operations to allow the foundation, bedding and backfilling material to be compacted to the specified relative compaction.

6.4 Trench Material

6.4.1 Bedding, Haunch, Side Zone and Backfill Material

Unless otherwise by this Specification, bedding, haunch, side zone and other backfill materials shall be in accordance with the following applicable requirements:

Recycled materials may be used, provided they meet the requirements of the relevant standards. The Service Provider shall obtain sample coarse particle size distributions from the manufacturer which is representative of the material to be used on site and submit them to Council's Representative for approval prior to use.

6.4.2 Compliance Testing for Bedding, Haunch and Side Zone Material

Test results provided by the suppliers of bedding, haunch, side zone material and other backfill materials shall be obtained by the Service Provider prior to the commencement of use of any material. Further testing in accordance with Table 6.1 below shall be carried out on material delivered to site to confirm compliance of the delivered material. All test results shall be submitted to Council’s Representative.

Table 6.1 Stormwater Trench Bedding and Backfill Material Testing

<table>
<thead>
<tr>
<th>Characteristic Analysed</th>
<th>Test Method</th>
<th>Minimum Frequency of Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backfill Material Grading</td>
<td>AS1289.3.6.1</td>
<td>1 per 100m³ or part thereof for bedding, haunch and side zone material</td>
</tr>
<tr>
<td>Backfill Material Plasticity</td>
<td>AS1289.3.3.1</td>
<td>1 per 200m³ or part thereof for bedding and haunch zone material</td>
</tr>
</tbody>
</table>

AS1289.3.6.1:2009 – Methods of testing soils for engineering purposes - Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving.

AS1289.3.3.1:2009 – Methods of testing soils for engineering purposes - Soil classification tests - Calculation of the plasticity index of a soil.

6.4.3 Non-complying Test Results for Bedding, Haunch and Side Zone Material

6.4.3.1 General

A non-compliance report shall be submitted to Council’s Representative for any non-complying works that the Service Provider is requesting acceptance of. This report shall contain information in support of the request. Work shall not proceed further on any non-complying item until Council’s Representative has considered the non-compliance and approved the works to proceed.
6.4.3.2 Non-complying Material Test Results

In any case where material grading and plasticity does not comply on the basis of test results the Services Provider shall remove the non-complying material from the site or use it elsewhere on the site as general fill. Council’s Representative may request further testing on material to confirm the extent of non-compliance.

6.5 Bedding

Pipe bedding shall not be placed if the trench foundations do not have suitable bearing capacity. The Service Provider shall confirm the suitability of foundation material from the Consulting Geotechnical Engineer or Council’s Representative.

Bedding material shall comply with the grading in Table 6.2 below.

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>Mass Passing (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0</td>
<td>100</td>
</tr>
<tr>
<td>2.36</td>
<td>100 – 50</td>
</tr>
<tr>
<td>0.6</td>
<td>90 – 20</td>
</tr>
<tr>
<td>0.3</td>
<td>60 – 10</td>
</tr>
<tr>
<td>0.15</td>
<td>25 – 0</td>
</tr>
<tr>
<td>0.075</td>
<td>10 – 0</td>
</tr>
</tbody>
</table>

Any material passing the 0.075mm sieve shall have low plasticity as described in Appendix A of AS1726 – Geotechnical site investigations.

Bedding and backfilling of “Buried Flexible Pipelines” and “PVC Pipe Systems” shall be carried out in accordance with AS2566 – Buried Flexible Pipelines and AS2032 – Installation of PVC Pipe Systems respectively unless the Utility Authority that will take over the pipe or conduit as their asset specifies other backfilling requirements.

Bedding and backfilling of box culverts shall be in accordance with the requirements of AS1597 – Precast Reinforced Concrete Box Culverts. Material within 1m of road pavement subgrade levels shall be compacted to road pavement subgrade compaction requirements described in Section 5 - Site Clearing and Bulk Earthworks of this Specification.

Bedding and backfilling of reinforced concrete pipes or fibre reinforced concrete pipes shall be in accordance with the requirements of AS3725 – Design for Installation of Buried Concrete Pipes for a HS2 support condition where not under a road pavement and HS3 support condition where under a road pavement except that all pipe backfill consisting of granular material complying to the requirements for "select fill in side zones" in accordance with AS3725 shall be provided to at least
150mm above the top of the pipeline or in the case of a pipe laid below a road pavement the material shall extend to the pavement subgrade level.

The bedding material shall extend over the full width of the trench and shall be compacted by tamping, rolling and/or vibration to a minimum Density Index (DI) of sixty (60) under non trafficable areas and minimum Density Index (DI) of seventy (70) under trafficable area is accordance with AS2566.

The bed level shall be graded to provide for a uniform fall to the discharging end of the pipeline, with line and level as shown on the approved drawings.

For pipes with sockets protruding beyond the barrel outside surface, chases shall be dug into the bed and foundation, if necessary, in the appropriate positions so that each pipe is supported along the full length of the barrel and the socket is not subjected to point loading.

### 6.6 Laying and Jointing of Pipes, Conduits and Installation of Box Culverts

#### 6.6.1 Pipes

Laying and jointing of all pipe types shall be in accordance with the manufacturers’ recommendations. Failure to follow manufacturers’ recommendations will result in the pipe line being deemed non-compliant.

Unless otherwise specified, commence laying pipes at the outlet end and proceed upstream.

Pipes shall be laid and jointed to the lines, grades and levels shown on the approved drawings. Pipe barrels shall bear uniformly on the prepared bedding over their full length. Pipelines shall be cleaned of debris and obstructions as laying and jointing proceeds.

The design levels or alignment for stormwater drainage culverts shall not be varied without the approval of Council’s Representative.

Pipes shall be laid in straight lines between pits/headwall and on a uniform vertical grade such that no ponding of water occurs unless otherwise shown on the approved drawings.

For pipe laying tolerances, refer to 6.6.4 Construction Tolerances.

Where shown on the approved construction drawings stormwater pipes shall be laid to a curved alignment, concentric with the curved line. For curved pipelines, the minimum radius achieved by pulling joints shall be in accordance with the manufacturer’s recommendations. When splayed pipes are used the splays shall be factory formed.

Rubber ring joints shall be fitted in the manner described by the manufacturer.

Materials and jointing requirements for PVC pipes shall be in accordance with AS2032:2006 – *Installation of PVC pipe systems*. 

**Revision date:** Aug-18
Deflections of rubber ring joints on PVC pipes are not permitted. Curvature shall be obtained by bending the pipe whilst maintaining the position of the joint in the trench. In any case jointing shall comply with the manufacturer’s recommendations.

All constructed pipelines shall be cleaned of foreign matter, soil and construction materials prior to inspection.

Lifting holes in pipes shall be fitted with purpose manufactured plugs before commencing backfilling.

At the discharge end of pipes terminating at gully pits or headwalls a three (3) metre length of 100mm diameter subsurface pipe shall be laid in the bottom of the trench discharging through the wall of the gully pit or headwall at 50mm above the invert level of the drainage pipe. The subsurface pipe shall be enclosed in a seamless tubular filter fabric and the subsurface pipe shall be sealed at the upstream end. When the discharging pipe is 1200mm diameter or larger two (2) three (3) metre lengths of subsurface pipe shall be provided.

6.6.2 Box Culverts

Reinforced concrete cast in situ base slabs and walls (if applicable) shall be constructed in accordance with the structural details and specification shown on the approved construction drawings. Should cast in situ base slab and/or wall details not be shown on the approved drawings the Service Provider shall engage the services of a qualified Structural Engineer to provide the required drawing details and specification. The details and specification shall be accepted by Council’s Representative prior to base slab construction.

Precast Crown and floor slabs may be acceptable to Councils Representative, Crown Units to be designed to AS 1597.2:2013 - Precast reinforced concrete box culverts Large culverts and precast floor slabs designed by a qualified structural engineer.

Concrete for cast in situ box culvert elements shall not be poured until the reinforcement and formwork has been inspected and approved by the Structural Engineer and accepted by Council’s Representative. A certification report shall be prepared by the Structural Engineer. This report shall confirm the construction of all cast in situ elements is in accordance with the design requirements. A copy of this report shall be provided to Council’s Representative.

Precast box culvert crown units are not to be placed on the base slab until it has cured for a minimum of fourteen (14) days and all formwork removed. This requirement shall only be changed at the request of the Structural Engineer and with approval of Council’s Representative.

Precast box culvert units shall be installed in accordance with the requirements of AS 1597.1 and AS 1597.2 – Precast reinforced concrete box culverts Small/Large culverts and the following additional requirements:

- All mortar joints shall be protected from the sun and cured in an approved manner for a minimum of forty-eight (48) hours.
- External crown unit cell joints shall be covered with a centrally located strip of approved bituminous impregnated fibre material a minimum of 200mm in width which shall be adequately bonded to the box culverts.
- Precast base unit slab joints shall be placed on a strip of geotextile A44 or equivalent with a minimum of 250mm lap to each unit. Once base units are in place, the geotextile fabric is wrapped up the base slab side and placed under the crown unit leg to ensure no infiltration of surrounding soil or sand through the joint.
- All lifting hooks shall be removed and exposed steel treated with an epoxy sealant.
- Construction vehicles and plant shall not place load on the box culvert until 28 days after casting of the base slab unless otherwise specified by the Structural Engineer responsible for the design and certification of the base slab.

6.6.3 Connection of Stormwater Pipe or Box Culverts to Existing Structures

Where stormwater drainage conduits are shown to be connected to existing junction pits, inlet pits or other box culverts and details of the connection are not provided on the approved construction drawings, the existing structure shall be cored where possible or otherwise saw cut and walls broken out to the minimum extent necessary. The area of the break out or coring shall be reinstated to the satisfaction of Council’s Representative.

If more than one wall of an existing stormwater pit is required to be broken out or cored then the entire pit shall be reconstructed unless otherwise approved by Council’s Representative.

6.6.4 Construction Tolerances

Stormwater Pipelines and Box Culverts shall be constructed within the tolerances shown in Table 6.3 below.

<table>
<thead>
<tr>
<th>Grade Line (Vertical Alignment)</th>
<th>Tolerance (per pipe length or part thereof deviation from the design grade line level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1%</td>
<td>± 10mm</td>
</tr>
<tr>
<td>1.01 to 4.0%</td>
<td>± 15mm</td>
</tr>
<tr>
<td>4.01% to 7%</td>
<td>± 20mm</td>
</tr>
<tr>
<td>7.01% upwards</td>
<td>± 25mm</td>
</tr>
<tr>
<td>Horizontal Alignment</td>
<td>± 50mm</td>
</tr>
</tbody>
</table>

Notwithstanding the above vertical tolerances, each length shall fall in the direction of the design grade line. No adverse grades shall be permitted on any section of the pipeline or box culvert.
Notwithstanding the above horizontal tolerances, where pipe joints are pulled to suit curved kerb alignments, the maximum deflection recommended by the manufacturer shall not be exceeded.

Within mine subsidence areas the manufacturers recommendations in regards to maximum pipe deflections is to apply based on design ground strains. Design ground strains can be obtained from the Mine Subsidence Board.

Construction tolerances shall be demonstrated by work-as-executed levels and positions confirmed on site by a Registered Land Surveyor and shown on the work-as-executed drawings. Refer to Appendix A - Work-as-Executed (WAE) Drawings for details.

### 6.6.5 Compliance Inspections and Documentation

Compliance with Sections 6.2 to 6.6 of this Specification will be demonstrated by:

- Observations made during site inspections by the Council’s Representatives during the installation of pipes, box culverts and conduits.
- Work-as-executed information confirming compliance with level and position tolerances.
- Provision of Structural Engineer’s certification where applicable.
- Provision of Closed Circuit Television (CCTV) Camera footage of all stormwater lines to demonstrate correct jointing, no structural damage to pipes or box culverts and all pipes and box culverts have been cleaned. CCTV camera footage shall be taken following the pre-final inspection but before the final inspection.
- Provision of the results of testing as specified.

All documentation demonstrating compliance shall be provided to Council’s Representative prior to the final inspection.

### 6.7 Backfilling

Under this section of the Specification, backfilling is the remainder of filling in the trench above the bedding to finished surface level or pavement subgrade level.

Backfilling shall be carried out in a manner which shall not cause damage to or move the pipes or box culverts.

### 6.7.1 Pavement Areas

Where pipes are laid under road pavement or kerb and gutter, backfill shall extend from the top of the bed zone up to pavement subgrade level and shall be fill material complying with the requirements shown in Table 6.2 Bedding Material Criteria for the bed zone.

The material shall be placed over the full width of the trench in layers not exceeding 150mm compacted thickness and compacted by vibration to achieve a minimum Density Index (DI) of 70%. The top 200mm shall be compacted to achieve a minimum DI of 80% or as specified in Table 5.1 Earthworks Relative Compaction Requirements.
6.7.2 Paths, Easements and Reserves

Where pipes are laid in areas not subject to vehicular loading, backfilling of reinforced concrete pipes or fibre reinforced concrete pipes shall be in accordance with the requirements of AS3725:2007 – Design for Installation of Buried Concrete Pipes for a minimum H2 support condition. The backfill shall extend from the top of bed zone up to the designed surface level less any allowances for landscaping. Backfill material shall consist of fill material complying with the requirements for bed zone material placed to a level half way up the pipe barrel and compacted to achieve a minimum DI of 50%. The remainder of the backfill shall consist of Imported Fill / Backfill as specified Section 5.4.6 Imported Fill Material compacted to achieve 95% standard relative compaction.

Refilling of sheeted trenches shall be carried out to the following requirements:

- No struts, walling or other supports shall be removed until the top of compacted refilling has reached the level of these supports.
- No wall sheeting shall be totally removed from the trench until the level of the compacted refill is within 1500mm of the surface.
- No wall sheeting shall be removed, in dewatered trenches, until the level in water table between natural ground and refill material is less than 500mm.
- The wall sheeting shall be withdrawn or removed in such a manner that the pipe and compacted bed and haunch support are not disturbed during such withdrawal or removal.

Bedding and backfilling of box culverts shall be in accordance with the requirements of AS1597 – Precast Reinforced Concrete Box Culverts. Material within one (1) metre of road pavement subgrade levels shall be compacted to road pavement subgrade compaction requirements described in Section 5 - Site Clearing and Bulk Earthworks of this Specification.

6.8 Trench Backfilling Compliance Testing

6.8.1 Compaction Testing Requirements

A Consulting Geotechnical Engineer shall be employed by the Service Provider to carry out all testing and inspections required to ensure backfilling compaction and material grading comply with this Specification. All samples shall be tested by a National Association of Testing Authorities (NATA) Registered Laboratory. All test results certificates/reports shall be forwarded to Council’s Representative.

Copies of the test certificate/reports shall clearly describe:

- The date the test was taken.
- The location and layer or level of each test.
- The compaction conformance requirement of this Specification.
- If the test is a retest and what test it is a retest of.
Compaction conformance requirements for work carried out under Section 6 - Stormwater and Subsurface Drainage Construction of this Specification are itemised in Table 6.4 below.

A successive layer of trench backfill shall not be placed until the underlying layer has been proven to be conforming to this Specification as determined by testing. If the Service Provider decides to place successive layers and the underlying layer does not conform to the compaction criteria all successive layers or work above the non-conforming layer shall be removed and the non-complying layer reworked and retested.

<table>
<thead>
<tr>
<th>Item</th>
<th>Compaction Requirement (Minimum Relative Compaction)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum density ratio (at standard compaction)</td>
</tr>
<tr>
<td>Box Culvert Bedding</td>
<td>95%</td>
</tr>
<tr>
<td>All other bedding, haunch zones, side zones</td>
<td>In accordance with AS3725-2007, AS2566-2000, AS2032-2006 and AS1597.1:2010 or AS1597.2:2013</td>
</tr>
<tr>
<td>150mm above pipe to 150mm below subgrade level under pavement areas</td>
<td>95%</td>
</tr>
<tr>
<td>Within 150mm road subgrade under pavement areas</td>
<td>100%</td>
</tr>
<tr>
<td>Backfill using site excavated material or suitable imported material from 150mm above the pipe to finished surface level not under a road pavement</td>
<td>95%</td>
</tr>
</tbody>
</table>

AS3725:2007 – Design for installation of buried concrete pipes
AS2566:2000 – Electric resistance welded steel air heater tubes
AS2032:2006 – Installation of PVC pipe systems
AS1597.1:2010 – Precast reinforced concrete box culverts - small culverts
AS1597.2:2013 – Precast reinforced concrete box culverts - large culverts

6.8.2 Test Method for Compliance

Test methods used for the determination of compaction compliance shall be in accordance with Section 8 of AS3725:2007 – Design for installation of buried concrete pipes and AS1289:2007 –
Methods of testing soils for engineering purposes. Field densities shall be determined by "direct" methods. Approval of "indirect" methods to determine field densities will be considered following a submission to Council’s Representative from the Consulting Geotechnical Engineer detailing the use of the method and correlations with backfill materials. In the case of penetrometer testing being used as an "indirect" method of testing the frequency of testing shall be as described below.

The specified testing shall be taken at random test locations established in each trench in accordance with the specified minimum testing frequency stipulated in Table 6.5 below. Prior to testing the Service Provider shall work the trench foundation, bedding or backfill to ensure uniform moisture content and compaction of all material within the trench.

Compaction testing of the bedding layer may not be required provided the Service Provider has demonstrated that bedding material has been consistently compacted by mechanical means where trenches are 700mm or wider and the bedding material has a moisture content that allows optimum compaction. The Consulting Geotechnical Engineer, the Accredited Certifier, or Council’s Representative may direct compaction testing on the bedding to confirm compaction should there be any doubt that the compaction effort provided is not achieving the compaction requirement.

Compaction testing of interallotment stormwater trench backfill may not be required for pipe diameters of 300mm diameter or less provided the Service Provider has demonstrated that backfilling material has been consistently compacted for the full depth of the trench.

6.8.3 “Indirect” Penetrometer Testing

Indirect Penetrometer testing of backfill, where approved by the Council’s Representative, shall be used in accordance with the following.

6.8.3.1 Trenches Below Pavements and Kerb and Gutter

This testing shall consist of:

- For pipe diameter less than 900mm - penetrometer testing at subgrade level shall be required to the depth of the trench both sides of the pipe.
- For pipe diameter greater than 900mm - penetrometer testing at top of pipe to the bottom of the trench both sides of the pipe and at subgrade level to the top of pipe level.
- For multi-celled lines - additional penetrometer testing between cells shall be required for the full depth of the trench in accordance with the dot points above.

6.8.3.2 Trenches in Areas Outside of Road Pavement and not under Kerb and Gutter

This testing shall consist of:

- For pipe diameter less than 900mm - penetrometer testing at finished level less any surface treatment shall be required to the depth of the trench one side of the pipe.
- For pipe diameter greater than 900mm - penetrometer testing at top of pipe to the bottom of the trench one side of the pipe and at finished level less any surface treatment to the top of pipe level.
- For multi-celled lines - additional penetrometer testing between cells shall be required for the full depth of the trench in accordance with the dot points above.

Direct density testing shall be carried out sufficiently in the opinion of the Consulting Geotechnical Engineer to correlate penetrometer test results with densities.

For penetrometer testing a maximum spacing of fifty (50) metres between tests on each side of the pipe applies with a minimum of two (2) tests on each side of the pipe being taken between pits/drainage structures/outlets.

Penetrometer test results shall be presented by a Consulting Geotechnical Engineer with supporting information, including correlations to indicate the adequacy of the results.

**6.8.4 Frequency of Testing**

The method of testing shall be in accordance with Section 8 of *AS3725:2007 – Design for installation of buried concrete pipes*. The frequency of testing shall be in accordance with Table 6.5 below. If Table 6.5 does not cover a particular situation the Consulting Geotechnical Engineer or Council’s Representative shall specify the required frequency of testing.

### Table 6.5 Trench Bedding and Backfill Relative Compaction Method and Frequency of Testing

<table>
<thead>
<tr>
<th>Characteristic Analysed</th>
<th>Minimum Frequency of Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compaction and moisture content of backfilling for transverse trenches less than 1200mm wide (under roads, paths and driveways)</td>
<td>1 test in haunch zone, side zone or up to 150mm above pipe; and 1 test between 150mm above pipe and subgrade or finished surface</td>
</tr>
<tr>
<td>Compaction and moisture content for transverse trenches greater than 1200mm wide (under roads, paths and driveways)</td>
<td>1 test in haunch zone, side zone or up to 150mm above pipe; and 1 test between 150mm above pipe and subgrade or finished surface</td>
</tr>
<tr>
<td>Compaction and moisture content for longitudinal trenches (under roads, paths and driveways)</td>
<td>1 test in haunch zone, side zone or up to 150mm above pipe; and 1 test between 150mm above pipe and subgrade, or finished surface every 50m, or at least 1 set of tests between pits or structures greater than 10m spacing</td>
</tr>
<tr>
<td>Compaction and moisture content for trenches elsewhere</td>
<td>1 test in haunch zone, side zone or up to 150mm above pipe; and</td>
</tr>
</tbody>
</table>
6.8.5 Determination of the Location of Field Compaction Tests and Field Sampling

For all trench backfill testing, the Consulting Geotechnical Engineer shall determine the location within the length of the trench where sampling and testing will be taken independently of any advice or request by the Service Provider(s) responsible for the works. Any evidence of tests and sampling locations being determined by the Consulting Geotechnical Engineer in collaboration with the Service Provider(s) responsible for the earthworks will be deemed as noncomplying tests. In this case a new set of tests shall be required to be carried out in locations nominated by Council’s Representative. Noncomplying Trench Compaction Results and Retesting Requirements

6.8.5.1 General

A noncompliance report shall be submitted to Council’s Representative for any noncomplying works the Service Provider is requesting acceptance. This report shall contain information in support of the request. Work shall not proceed further on any non-complying item until Council’s Representative has considered the non-compliance and approved the works to proceed.

6.8.5.2 Non-complying Compaction Test Results and Retesting Requirements

Where compaction does not comply on the basis of an inspection or test results the Service Provider shall rework the layer inspected and/or tested for a length of twenty-five (25) metres either side of the test location or the total length between pits/structure if that length is less than fifty (50) metres. Retest of the layer shall be taken anywhere in the reworked area. The retest report shall be clearly labelled as a retest.

6.9 Concrete Drainage Structures

6.9.1 General

This section covers the requirements for structures that are cast in situ or precast concrete required as part of stormwater drainage systems. Drainage structures include inlet pits, junction pits, headwalls, open concrete channels, and other structures associated with the stormwater drainage construction. This section does not cover concrete kerb and gutter.

Before any work is commenced on a particular drainage structure under an embankment, the area occupied by the structure and five (5) metres either side of the structure shall:

- Be cleared and grubbed (refer Section 5.2 Clearing and Grubbing); and
- Have topsoil removed in accordance with Section 5.3 Earthworks Excavation of this Specification; and
- Have the embankment foundations prepared in accordance with Section 6.7 Backfilling of this Specification, including removal of unsuitable material.
All drainage structures contained in the body of an embankment shall be installed in the normal trench conditions.

All cast in situ concrete drainage structures other than those shown in Council’s Civil Works Specification – Standard Drawings, or shown on Roads and Maritime Services Standard Drawings referred to in this Specification, shall be designed and constructed in accordance with the requirements of AS3600:2009 – Concrete structures. The Service Provider shall engage a Civil or Structural Engineering Consultant to provide a detail and specification for the required drainage structure if design details of cast in situ drainage structures are not:

- Shown on the approved construction drawings.
- Approved to be a precast structure from a recognised precast concrete manufacturer.

Generally, all drainage structures, other than those detailed in Council’s Civil Works Specification – Standard Drawings, shall be designed and specified with a B1 exposure classification in accordance with the requirements of AS3600:2009 – Concrete structures as a minimum. However, a more severe exposure classification shall be required to be adopted where the location of the structure dictates, for example in a tidal zone or coastal exposure situation.

All drainage structure designs arranged by the Service Provider shall be submitted to Council’s Representative for acceptance.

Internal and external surfaces of walls of all cast in situ structures shall be formed unless the depth of the structure and nature of the ground permit walls to be cast without external forms. The ground strata providing the external form must be undisturbed and trimmed to an even vertical surface so that resulting wall thickness is increased by at least 50mm but not more than 100mm over that detailed on the approved drawings. In any case external formwork shall be used for the top 300mm of all walls.

Any concrete poured for cast in situ drainage structures shall be vibrated during placement. Following the removal of formwork, concrete visually displaying insufficient compaction by evidence of excessive surface honeycombing shall be removed and reconstructed unless an alternative method of repair is accepted by Council’s Representative.

All drainage structures shall be designed and constructed to address all safety related issues including, but not limited to:

- Pit openings.
- Access and bicycle/pedestrian friendly grates.
- Requirement for guardrail.
- Safety fences or railings.
Council’s Representative may instruct the Service Provider to address safety issues through additional works should safety issues not be adequately addressed on the drawings.

At the discharge end of pipes terminating at gully pits or headwalls, a 3m length of 100mm diameter slotted subsurface pipe shall be laid on the pipe bedding layer and cast into the wall of the fully pot or headwall at the same invert level as the drainage pipe. The slotted subsurface pipe shall be sealed at the upstream end and shall be enclosed in a seamless tubular filter fabric. When the discharging pipe is 1200mm diameter or larger, two (2) 3m lengths of subsurface pipe shall be provided on each side of the pipe.

All drainage structures shall be constructed on foundations that provide adequate bearing support for the structure. Council’s Representative may direct the Service Provider to have a Consulting Geotechnical Engineer confirm that the foundation bearing capacity for a structure is adequate.

Drainage structures shall be constructed to the level tolerances applicable for adjacent pipe or box culvert grades. The more conservative tolerance shall be adopted where differing grades enter the same structure.

The location for drainage structures shall be constructed within ±100mm from the designed locations unless otherwise approved by Council’s Representative.

All drainage structures, other than those located in road pavements or other paved areas shall be provided with a turf surround at the finished adjacent surface as shown in Council’s Civil Works Specification – Standard Drawings, unless otherwise detailed or a different treatment is required to comply with environmental considerations, landscaping requirements or vegetation management.

All grated surface inlet pits including interallotment drainage pits shall be constructed so the grate inlet is 100mm below the surrounding surface level.

Pits and headwall dimensions, unless covered by a standard drawing in Council’s Civil Works Specification – Standard Drawings, shall be in accordance with the sizes shown on the approved drawings. The required dimension of the pit shall be confirmed with the person(s) that prepared the design if the depth of the pit varies from that shown on the drawings. Any changes in pit sizes shall be brought to the attention of Council’s Representative.

### 6.9.2 Standard Drawings

Standard drawings relating to drainage structures are contained in Council’s Civil Works Specification – Standard Drawings.

Any variations to the requirements of the Standard Drawings must be accepted by Council’s Representative prior to construction/installation.

Headwalls with concrete aprons shall be constructed in accordance with the latest Roads and Maritime Services Standard Drawings incorporating the requirements as noted below. Roads and Maritime Services Standard Drawings can be obtained from the [Roads and Maritime Services website](http://roadsandmaritime.com.au).
6.9.3 Precast Pits and Structures

Details of precast structures shall be submitted to Council’s Representative for acceptance prior to the Service Provider ordering these products.

Precast pits shall not be accepted for any stormwater drainage pits to be constructed in the road reserve without prior approval from Council’s Representative. Precast pits that are accepted for use in the road reserve shall have minimum wall thickness of 150mm, unless otherwise approved, and have pre-formed holes for the pipe sizes being used.

Precast kerb inlet and grate units are acceptable provided they conform to the requirements of Council’s Civil Works Specification – Standard Drawings. All lintels and grates in road reserves shall be Load Class D in accordance with AS3996:2006 – Access Covers and Grates.

Cracked precast structures shall not be accepted at any stage of the works.

Where precast pits are accepted for use by Council’s Representative, all other requirements applying to cast in situ stormwater pits shall apply.

6.9.3.1 Interallotment Stormwater Drainage Pits

Wet cast precast pits are acceptable for use as interallotment stormwater pits. Dry packed precast pits shall only be acceptable for interallotment stormwater pits if the pits are straight and square resulting pit components fit snugly to each other. Dry packed pits that have rough and/or honeycombed surfaces or appear to be excessively porous shall not be accepted. Details of dry packed pits proposed to be used shall be provided to Council’s Representative prior to any pits being delivered to site. Pits delivered to site that do not comply with the above criteria and/or do not reflect the details provided, in the opinion of Council’s Representative, shall not be accepted for use.

Where the depth of interallotment stormwater pits needs to be altered on site to suit site levels the pit size requirement shall also be altered to reflect the design requirements of Council’s Civil Works Specification – Design Guideline.

Interallotment stormwater pits shall have a galvanised steel grated inlet fitted flush to the top of the pit. The grate shall be secured to the pit with a galvanised chain to prevent removal.

6.9.4 Cast In Situ Stormwater Pits

For all cast in situ pits the base shall be poured first to allow the walls to be fully supported on the base. Walls shall be bonded to the base by cement grout to form a tight joint. The minimum base, wall and lid thickness for cast in situ pits shall be 150mm. Pits poured in multiple height sections shall require N12 starter bars of minimum length 400mm and at 300mm centres to be placed in the walls of preceding lift.

Cast in situ pits shall be constructed from concrete strength grade N25 minimum if no reinforcement is required in the pit. If reinforcement is required the concrete strength grade shall be N32 minimum.
The invert of all pits, regardless of being cast in situ or precast, shall be benched and streamlined using N20 concrete as a minimum, to provide a smooth finish and minimise turbulence of flow from inlet pipes to outlet pipes. Care shall be taken with benching and streamlining not to block subsurface drainage outlets.

Where drainage structures abut concrete paving, kerb and gutter or other concrete structures, a 10mm wide expansion/isolation joint shall be provided. The joint shall consist of preformed jointing material complying with Roads and Maritime Services QA Specification 3204 – Preformed Joint Fillers for Concrete Road Pavements and Structures, unless otherwise on the approved drawings. Total isolation of drainage structures is required where they are located within or abutting rigid pavements.

The class of grate used for all pits, unless specified on the approved drawings or on Council’s Civil Works Specification – Standard Drawings, shall be suitable for the intended use in accordance with AS 3996 i.e. Class “D” heavy duty for roads and Class “C” medium duty in reserves to suit maintenance plant.

All grates shall be hot-dip galvanised after fabrication.

Concrete to support grates shall have a slump of 70-80mm and vibrated into place. Kerb mix is unacceptable for this work.

Sealed or covered junction pits shall be constructed to the same standard as inlet pits except a sealed cover shall be provided as described below in this Specification.

### 6.9.5 Headwalls, Wing Walls and Energy Dissipaters

Headwalls, wing walls and energy dissipaters shall be constructed as detailed and shown on the approved construction drawings. Any adjustment to the location of these structures to suit site conditions shall be accepted by Council’s Representative.

Headwalls and wing walls shall be constructed to retain batters effectively and shall be extended if required to minimise adjacent batter slopes resulting in easily maintainable slopes. Such extensions may require additional structural details to be obtained by the Service Provider. Any additional details obtained by the Service Provider shall be submitted to Council’s Representative for acceptance.

Headwalls where not detailed on the approved construction drawings shall be constructed to comply with Roads and Maritime Services Standard Drawings for concrete headwalls with concrete aprons, except that the following shall be applicable:

- Reinforcing bars shall be “N” grade not “Y” grade as shown on some drawings.
- All concrete shall be minimum strength grade N32.
- Minimum cover to all reinforcement shall be 40mm, subject to the applicable exposure classification.
Suitable requirements, in accordance with the requirements of AS3600:2009 – Concrete structures, for concrete strength grade and cover to reinforcement shall apply in coastal tidal and splash zone.

Where rock is encountered at the bottom of excavations for wing walls and headwalls, the depth of cut-off walls in uniform rock over the full width of the foundations may be reduced to less than that shown on the approved construction drawings or the Standard Drawings, but must not be less than 150mm deep into sound rock.

6.9.6 Access Opening Covers for Junction Pits and Drainage Structures

Circular sewer access chamber covers shall not be used on any stormwater drainage structure. Other circular covers specifically for the purpose of stormwater pit or structure shall require approval from Council’s Representative. Where a circular type lid is approved it shall be clearly inscribed or marked in a permanent fashion with the letters "SW".

In path areas, road pavements and other paved areas and elsewhere if detailed, junction pits shall have Class “E” extra heavy duty or Class “D” heavy duty in accordance with AS 3996, as applicable, “Gatic” or equivalent type covers. In other areas not likely to be subject to vehicular traffic precast concrete covers and surrounds may be used.

Finished surface levels shown for drainage structures on the drawings shall be taken as guide only. The Service Provider shall be responsible for the establishment of accurate levels so that covers shall be finished:

- Flush to adjacent pavement levels in paved areas.
- 25mm above finished surface in landscaped areas.
- 75mm above natural surface elsewhere.

6.9.7 Backfilling of Drainage Structure Excavations

Backfilling of drainage structures shall not commence with 14 days of concrete been place or until the compressive strength of concrete has reached at least N20 unless otherwise shown on the approved drawings.

Where external formwork has been used for any drainage structures stabilised sand (3% to 5% cement) shall be used for backfilling excavations around drainage structures when located in the road reserve. In areas of existing or proposed road pavement stabilised sand shall be used to the natural pavement subgrade level.

In other areas selected granular backfill shall be placed and compacted against the full height of the vertical faces of structures for a minimum width of 500mm. Selected backfill shall consist of a granular material meeting the same requirements as side zone material in AS3725-2007 – Design for installation of buried concrete pipes and as specified in Section 6.9.3 Precast Pits and Structures of this Specification.

Where the sides of the excavation are steeper than four horizontally to one vertically (4:1), they shall be cut back in the form of successive horizontal terraces at least 500mm in width, as the backfill is placed.
Backfill to drainage structures shall be carried up to level in layers simultaneously. Compaction shall be in accordance with the requirements for backfilling of structures in Section 5 - Site Clearing and Bulk Earthworks of this Specification.

6.9.8 Modifications to Existing Structures

In the case of minor modifications to existing structures not being shown on the approved drawings the following shall apply. Where existing structures are to be raised or lowered, break out sufficient parts of the walls to expose reinforcement and to allow at least 150mm of new concrete below the new cover or frame. Splice new reinforcement to old as necessary, form and place concrete as specified for new structure.

In the case of major modifications to existing structures where details of the modification are not shown on approved construction drawings then the Service Provider shall engage a qualified Structural Engineer to provide advice on the modification of the structure. Copies of the advice shall be provided to Council’s Representative. The qualified Structural Engineer shall inspect all aspects of the modification construction and provide certification that the modification construction has been carried out in accordance with their recommendations.

6.9.9 Galvanising of Steel Fixtures

All steel fixtures including grates, frames, step irons, ladders, etc shall be hot-dip galvanised. Galvanising shall comply with the requirements of the appropriate following standard(s):

- AS/NZS 4792:2006 – Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process.

The average galvanising coating to items other than threaded fasteners shall be in accordance with the above standards. Threaded fasteners shall have an average galvanising coating of 375g/m². Surplus material shall be removed from threads of bolts so that no recutting is required.

6.9.10 Compliance Inspections and Documentation for Drainage Structures

6.9.10.1 Precast Drainage Structures

The Service Provider shall, when requested by the Accredited Certifier or Council’s Representative, provide copies of test certificates, Certification of structural adequacy, and any other documentation that may be required to verify that the supplied drainage structure complies with the specified standards and is suitable for the location in which it is being used.
6.9.10.2 Cast In Situ Drainage Structures

The Service Provider, when requested by the Accredited Certifier or Council’s Representative shall provide copies of test certificates and any other documentation that may be required to verify that the supplied materials comply with the specified standards.

The Service Provider shall provide copies of all structural designs and certification reports as required by this Specification to Council’s Representative. When a standard drawing is not used for the construction of a drainage structure, the Service Provider shall have the Designing Engineer inspect the structure during construction and certify that the construction is in accordance with the design and shall perform structurally as intended by the design.

The Service Provider shall provide, when requested, copies of reports by the Consulting Geotechnical Engineer verifying the foundation bearing capacity of drainage structures are adequate for the proposed structure to Council’s Representative.

6.10 Subsurface Drains

6.10.1 General

Subsurface drainage lines shall be installed along both sides of the road pavement, integral with stormwater drainage where stormwater drainage is under kerb and gutter and with stormwater drainage road crossing. Subsurface drainage shall also be required at the interface of new pavement and existing pavements where the new pavement material and/or depth is not consistent with the existing pavement material. Subsurface drainage lines may also be required in other areas as detailed on the approved drawings, or as described in geotechnical reports and pavement design reports, or if required to control subsurface water that becomes evident during construction.

Where the road shoulders are unsealed, the trenches for the subsurface pipes shall be placed 300mm clear of the outer edge of the pavement. If the shoulders are to be bitumen seal e.g. where concrete kerb and gutter, gutter, lined or pitched table drains are used, subsurface pipes shall be placed adjacent to the gutter or drain and beneath the outside edge of the sealed shoulder.

If transverse drains are also required to control water which collects beneath the pavement from springs, or by penetration through the pavement, these drains shall be laid so as to intersect the longitudinal drains at approximately forty-five degrees (45°) to their direction of fall.

All subsurface drainage shall be installed in a trench backfilled with filter material in accordance with this Specification.

This section of the Specification does not apply to subsurface drainage to be installed as part of a water treatment device such as a bio-filtration basin or swale or similar. Details for these types of subsurface drainage shall be shown on the approved drawings or contained within other specifications referred to on the approved drawings.
6.10.1.1 Standard Drawings

The general location, arrangement and some other requirements for subsurface drainage are described in Council's Civil Works Specification – Standard Drawings.

6.10.2 Subsurface Drainage Materials

6.10.2.1 Pipes

Pipes for subsurface drains shall be 100mm diameter corrugated flexible PVC perforated drainage pipe class 1000 complying with the requirements of AS2439:2007 – Perforated plastics drainage and effluent pipe and fittings. A filter sock shall be required on all pipe installed with sand filter type material.

Other pipe types may be accepted for use following submission of documentation to Council's Representative confirming their compliance with AS2439:2007 – Perforated plastics drainage and effluent pipe and fittings and suitability for the proposed use. Other pipe types that will be considered are perforated or slotted pipes of other material including PVC, PP and geo-composite plastic filter strips. The filter strip may be either a rigid or flexible plastic core with slots or openings and shall be totally encased in a specially manufactured and fitted geo-textile fabric.

Joints, couplings, elbows and tees shall conform to the manufacturer's specifications using the manufacturer's appropriate accessory fittings, unless approved by Council's Representative.

6.10.2.2 Aggregate Filter Materials

Filter Material shall conform to the following grading requirement (Roads and Maritime Services Test Methods T201 – Particle distribution of aggregates (by washing) and T203 – Particle distribution of aggregates finer that 75µm (by washing) shall determine the grading):

<table>
<thead>
<tr>
<th>AS Sieve Size (mm)</th>
<th>Passing by Mass (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.5</td>
<td>100</td>
</tr>
<tr>
<td>4.75</td>
<td>90 – 100</td>
</tr>
<tr>
<td>2.36</td>
<td>75 – 100</td>
</tr>
<tr>
<td>1.18</td>
<td>50 – 90</td>
</tr>
<tr>
<td>0.6</td>
<td>30 – 60</td>
</tr>
<tr>
<td>0.3</td>
<td>10 – 30</td>
</tr>
<tr>
<td>0.15</td>
<td>2 – 10</td>
</tr>
<tr>
<td>0.075</td>
<td>0 – 3</td>
</tr>
</tbody>
</table>

Table 6.6 Subsurface Drainage Aggregate Filter Material
6.10.2.3 Sand Filter Material

Sand filter material shall conform to the particle size distribution requirements in Table 6.7 below after pre-treatment in accordance with Roads and Maritime Services T102 – Pre-treatment of Road Construction Materials by Compaction, Method A.
### Table 6.7 Subsurface Drainage Sand Filter Material Grading Requirements

<table>
<thead>
<tr>
<th>AS Sieve Size (mm)</th>
<th>Passing by Mass (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.75</td>
<td>100</td>
</tr>
<tr>
<td>2.36</td>
<td>95 – 100</td>
</tr>
<tr>
<td>0.425</td>
<td>20 – 80</td>
</tr>
<tr>
<td>0.300</td>
<td>0 – 30</td>
</tr>
<tr>
<td>0.150</td>
<td>0 – 10</td>
</tr>
<tr>
<td>0.075</td>
<td>0 – 1</td>
</tr>
</tbody>
</table>

Particle size distribution shall be in accordance with Roads and Maritime Services Test T201 - *Particle distribution of aggregates (by washing)* with the addition of the 425µm AS sieve. The percentage passing the 75µm AS sieve shall be determined by Roads and Maritime Services test T203 - *Particle distribution of aggregates finer than 75 µm (by washing)*.

After pre-treatment, sand filter material must have a coefficient of saturated permeability of at least 8m/day when compacted to 100% of standard compaction and tested in accordance with Roads and Maritime Services test T1311 - *Determination of Permeability of a Soil - Constant Head Method*.

#### 6.10.2.4 No Fines Concrete Filter Material

No fines concrete shall only be used for subsurface drainage filter material when specified by the Consulting Geotechnical Engineer or required by Council’s Representative. The no fines concrete shall have an aggregate to cement ratio between 6:1 and 8:1 by mass. The water cement ratio shall be 0.35 to 0.45 by mass. The aggregate size distribution shall conform to Table 6.8 below and shall have minimum 98% by mass of aggregate with one fractured face.

### Table 6.8 Sub-surface Drainage No Fines Concrete Aggregate Grading Requirements

<table>
<thead>
<tr>
<th>AS Sieve Size (mm)</th>
<th>Passing by Mass (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>26.5</td>
<td>100</td>
</tr>
<tr>
<td>19.0</td>
<td>95 – 100</td>
</tr>
<tr>
<td>9.5</td>
<td>0 – 5</td>
</tr>
</tbody>
</table>

#### 6.10.2.5 Alternative Filter Material

The use of filter materials not meeting the specified grading requirements may also be approved for use subject to adequate grading and permeability testing and a report from the Consulting
Geotechnical Engineer confirming suitability as a filter material for road pavement subsurface drainage.

6.10.2.6 Geotextile

Geotextile filter/separation layer when used in the subsurface drainage trench with aggregate filter material shall meet the requirements of Roads and Maritime Services Specification R63 Geotextiles (Separation and Filtration).

6.10.3 Compliance Testing

The Service Provider shall provide a copy of filter material grading and aggregate size distribution test results prior to the supply of the material to the site.

Following delivery of filter material to the work site, the Service Provider shall arrange for the Consulting Geotechnical Engineer to carry out a minimum of two (2) random particle size distribution tests on filter material per 500 lineal metres of subsurface drainage lines or part thereof for material delivered to the site. The requirement for site testing of filter material shall be relaxed where there is less than 100 metres of subsurface drainage being constructed.

The Consulting Geotechnical Engineer shall determine where sampling and testing shall be taken independently of any advice or request by the Service Provider(s) responsible for the works.

6.10.4 Trenches

Subsurface drainage trenches shall be:

- A minimum 300mm wide unless otherwise described in the approved pavement design report; and
- A minimum 300mm below the subgrade base; and
- Excavated after pavement construction has reached pavement subgrade level or following placement of subgrade replacement and select layers.

Filter material shall extend from the bottom of the subsurface trench through to the bottom of pavement subbase material.

Trenches shall generally be graded at the same grade as the road. Trenches shall be graded such that the subsurface drains can discharge into a drainage structure. Where discharge is not to a drainage structure the subsurface drain shall be tailed out at minimum 1% grade until it is able to discharge at finished surface level.

The bottom of the trench shall be graded to remove any localised ponding greater than 20mm. If the trench is over excavated or localised ponding could occur, the trench floor shall be filled with non-porous natural subgrade material and compacted to 100% minimum density ratio (at standard compaction), to prevent ponding from occurring.

Unsuitable material in the base of the trench shall be removed and replaced with non-porous natural subgrade material compacted to 100% minimum density ratio (at standard compaction).
6.10.5 Bedding, Laying, Jointing and Placing Filter Material

Filter material shall not be used if it is contaminated by other soil or other deleterious matter.

The minimum grade for subsurface drainage lines shall be 1% unless otherwise approved by Council’s Representative. The filter material shall be used as bedding material and shall be placed below the pipe 50mm thick.

Pipe joints shall be made using a purpose made external joint coupling.

Filter material shall be placed in the trench so as to avoid segregation.

Where subsurface drainage pipe is laid in the stormwater drainage trench, the stormwater backfill material shall be replaced with material meeting the subsurface drainage filter sand grading requirements. The filter sand shall be placed so mixing or contamination of the filter material by other backfill materials is avoided. Filter sand backfill in stormwater drainage trenches shall extend from the stormwater bedding layer to pavement subgrade level or the bottom of subbase layer.

Filter material shall be compacted to Density Index of 70. The first layer above the pipe shall be 300mm deep. The filter material shall be placed and compacted in such a way as to ensure that the pipe does not move and is not damaged.

All faces of filter material in contact with topsoil or similar fine grained material shall be covered with geotextile material.

In trenches with hard rock bases, the requirement for trimming the base shall be relaxed subject to there being no adverse effect on overall drainage performance.

6.10.6 Flushing Points and Outlets

6.10.6.1 High Ends and Flushing Points

High ends and flushing points of drains shall be turned up and capped at the surface for final inspection. Once approved by Council’s Representative, the end to be capped and buried a minimum 300mm under the finished surface.

6.10.6.2 Outlets

Subsurface drains shall discharge into stormwater inlet pits and stormwater junction pits, where possible above the hydraulic head of the stormwater pipe. Outlets directly connected to pipes or to the surface shall only be used where absolutely necessary. Outlets to the surface shall have purpose made precast headwall and a stabilised tail out drain to direct any flow to the stormwater drainage system. Treatment of the tail out drain shall be confirmed on site with Council’s Representative.

6.10.7 Compliance Testing, Inspections and Documentation

Compliance with this Specification shall be demonstrated during site inspections by the Accredited Certifier or Council’s Representatives during the installation of subsurface drainage.
The Service Provider shall supply to Council’s Representative test result documentation that verifies that the supplied materials relating to subsurface drainage comply with the specified standards.

Work-as-executed drawings shall show the location of subsurface flushing points and outlets.

6.10.7.1 Pre-final Inspection

Subsurface drainage lines shall be cleaned of debris, silt and the like before the pre-final inspection. All flushed material shall be captured prior to it leaving the site system.

During the pre-final inspection all subsurface drainage lines shall be flushed whilst Council’s Representative is on site. Flushing shall demonstrate that the subsurface drainage line flows freely without any obstruction.

6.10.7.2 Final Inspection

All compliance documentation shall be submitted to Council’s Representative prior to the final inspection.

All uncompleted items and defects found during the pre-final inspection shall be completed and/or rectified prior to the final inspection.

Subsurface lines found to be defective by flushing at the pre-final inspection shall be flushed again in the presence of Council’s Representative during the final inspection.

6.11 Stormwater Outlets to Kerb and Gutter

For the installation of stormwater outlets to kerb and gutter, refer to Council’s Civil Works Specification – Standard Drawings.

For new subdivisions two (2) outlets shall be provided for each proposed lot that drains to the kerb and gutter. Outlets shall be located at the point in the kerb and gutter that is perpendicular to the front boundary from a point on the front boundary that is one (1) metre offset from each side boundary.

A 90mm diameter uPVC stormwater pipe shall be provided from the kerb outlet to a minimum 0.5m within the proposed lot boundary at 1% grade. The end of the pipe within the proposed lot shall be fitted with a tee fitting and riser to 300mm above the finished surface level. Both the open end of the tee and riser shall be capped. The cap on the riser shall be marked with the letters “SW”.

In existing residential areas where kerb and guttering exists, stormwater outlets shall be provided where required. The existing kerb shall be neatly saw cut and a minimum of 75mm either side of the heavy-duty galvanised steel outlet shall be removed. The outlet unit shall be set in place using a proprietary epoxy based repair mortar. Sand cement mix shall not be acceptable.

When roads are upgraded, the Service Provider shall be extend and connect property stormwater outlets to the new kerb and gutter.
6.12 Demonstration of Final Compliance for Stormwater Works

6.12.1 Inspections and Documentation

Confirmation of compliance of stormwater works shall only be given at a final inspection for the whole of the works for a development or staged release of the development. However, use of sections of stormwater lines for the control of stormwater within the works may commence upon completion of sections of the stormwater works provided that erosion and sediment control measures including scour protection in outlet drains is provided.

Work-as-executed drawings shall be prepared prior to the final inspection. These drawings shall show the following:

- Finished surface levels at all pits and structure and between pits and structures.
- Finished invert levels and pipe or box culvert grades.
- Changes to the horizontal position of any stormwater line, pit or structure.
- Confirmation of the installed pipe diameter, pipe type and class of pipe.
- Confirmation of the size of installed box culverts.

Work-as-executed information shall demonstrate compliance with level tolerances specified.

6.12.1.1 Pre-final Inspection

No section of the stormwater system shall be given a pre-final inspection until all contributing lines have been completed and connected, bituminous surfacing of contributing roads has been completed and all unpaved areas of the site have been adequately stabilised in order to prevent sediment entering the stormwater system.

Pipes and structures shall be cleaned of debris, sediment and the like before the pre-final inspection. Flushing of stormwater systems to clean the system is only allowed where there is no other practical method. All flushed material shall be captured prior to it leaving the site system.

6.12.1.2 Final Inspection

All uncompleted items and defects identified during the pre-final inspection shall be completed and/or rectified prior to the final inspection.

All compliance documentation relating to stormwater drainage and associated structures shall be submitted to Council’s Representative prior to the final inspection.
Section 7 - Utility Services Installation, Road Opening and Utility Restorations

7.1 General

This section of the Specification provides minimum technical standards and requirements for the opening and restoration of Council-controlled land including road pavement and ancillary road reserve assets in order to preserve the integrity and long-term serviceability of the road reserve.

For drainage installations see Section 6 - Stormwater and Subsurface Drainage Construction.

Utility Authorities, Council, contractors and private individuals may from time-to-time be required to open Council's road for the installation, accessing and/or repair of various public utility services including electricity, water and sewerage, gas and telecommunications.

When a road is to be opened or excavated, Council requires appropriate notification of such proposals to be provided by the proponent and where necessary seek approval through the completion of a Road Opening and Restoration Permit Application form, available on Council's Website, or consent under s138 of the Roads Act 1993.

At all times, utility services shall be installed within the Council footway allocation as per the NSW Streets Opening Conference 2009 Edition of Guide to Codes and Practices for Streets Opening. Any situations where deviation from footway allocation is unavoidable, specific approval as a non-conforming application must be sought from Council’s Representative prior to commencement of works (emergency works excluded).

When road openings are restored, the permanent restoration works are required to be inspected by Council’s Representative to ensure that the road has been returned to its previous state (or better) and a condition consistent with Council's required reinstatement standards.

This section applies to Utility Authorities, Contractors, Private individuals and Council staff.

7.2 Responsibility and Process for Council

In this Section, Council includes any Service Provider engaged to carry out the required works on behalf of Council.

Council, being a Roads Authority, is responsible for maintaining its road pavement and ancillary road reserve assets in a good and safe condition.

The Roads Act 1993 Section 101 empowers the Roads Authority to direct persons who dig up public roads to make restoration of those roads or to take action to recover costs associated with the restoration of disturbed roads.

The Roads Act 1993 Section 101 (in part):
101 Restoration of public road following excavation, etc

(1) A roads authority may direct any person by whom a public road is dug up to restore the road to its previous condition.
(2) If a public road is damaged as a result of a leakage from, or breaking or bursting of, any object or work placed in, on or over the road, the appropriate roads authority may direct the person:
   (a) who was responsible for placing the object or work in, on or over the road, or
   (b) who has the care or control of the object or work, or
   (c) whose act or omission caused the leakage, breaking or bursting, to restore the road to its previous condition.
(3) A direction under this section may specify:
   (a) the manner in which or the standard to which, and
   (b) the period (being at least 14 days) within which, the direction must be complied with.

Council is not required to complete a Road Opening Permit application for a road opening activity. However, Council shall consult with all relevant Council stakeholders prior to commencement of the activity. For example Roads, Water and Sewer and Stormwater Drainage shall be consulted if a road opening activity involves the installation of a sewer main within the road pavement and in the vicinity of drainage and sewer assets.

Council is responsible for undertaking all searches and obtaining necessary approvals associated with their proposed works. Other requirements to be addressed shall include:

- Complying with any relevant legislation.
- Environmental Impact Statement.
- Review of Environmental Factors.
- Environmental Management Plan.
- Safety requirements.
- Conditions of approval.

Where a road activity affects any State Roads, the Roads and Maritime Services shall also be contacted.

All utility services should be installed within the Council's footway allocation in accordance with the NSW Streets Opening Conference 2009. Council’s Representative shall be consulted where deviation from footway allocation is unavoidable.

Council is required to take into account any issues raised, requirements and conditions of approval prior to commencing a road opening activity.

Council’s Representative shall also be consulted regarding requirements for road reinstatement.

Council shall ensure works are being undertaken in accordance with this section of the Civil Works Specification. Council shall quality assure their excavation, backfilling and restoration works.
A quality assurance checklist shall be completed for the execution of all works including excavation, backfilling and restoration. Copies of quality checklists including all inspection and testing results shall be forwarded to Council’s Representative within seven (7) days of practical completion of works. At any time Council’s Representative may undertake random inspection of the works being carried out on site.

At least seven (7) days prior to commencement of physical work, Council shall notify:

- All relevant stakeholders including Council’s Representative.
- All affected residential frontage properties.

Council’s Representative shall be notified immediately following the completion of all temporary and permanent restoration works.

Council shall maintain any temporary restoration in a safe and trafficable condition.

Council’s Representative shall be consulted regarding who will be undertaking permanent restoration for the proposed works as well as any permanent restoration arrangement on behalf of the Council. If it is decided that Council shall be undertaking permanent restoration, the complete permanent restoration process shall be inspected and approved by Council’s Representative. Forty-eight (48) hours’ notice is required prior to permanent restorations being undertaken.

The permanent restoration is required to be warranted for a period of twenty-four (24) months by Council. During this period, the repair of defects such as subsidence and surface deterioration shall be the responsibility of Council.
A ROAD OPENING ACTIVITY IS REQUIRED

Council consults with all relevant stakeholders within Council

Consult with Council's Representative regarding requirements for road restoration

Consult with Council's Representative where deviation from footway allocation is unavoidable

Consult with the RMS if the proposed work affects State Roads

Council takes into account any issues raised, requirements and conditions of approval

Notify all relevant stakeholders and all affected frontage properties at least 7 days prior to commencement

Construction work commences

Notify Council's Representative immediately after completion of temporary restoration

Notify all relevant stakeholders immediately following the completion of the road opening activity

Council ensures a quality assurance checklist is completed for all works including excavation, backfilling and restoration. Forward a copy to Council's Representative

Council ensures works being undertaken in accordance with Council's requirements for road opening and restoration

Is Council undertaking permanent restoration?

YES

The complete permanent restoration process is required to be inspected and approved by Council's Representative (48 hours' notice is required)

Council maintains any temporary restoration in a safe and trafficable conditions

Council undertakes permanent restoration

Notify Council's Representative immediately after completion of permanent restoration

NO

Council requests Council's Representative to undertake permanent reinstatement.

Council maintains any temporary restoration in a safe and trafficable conditions

Council undertakes permanent restoration on behalf of Council

Restoration is completed. Council months warrants the permanent restoration for a period of 24 (Outcome No. 1)

Restoration is completed. Council's Representative carries out Defect Monitoring Program (Outcome No. 2)
7.3 Responsibility and Process for Utility Authorities

In this Section, Utility Authorities includes any Service Provider or contractor engaged to carry out the required works on behalf of a Utility Authority.

Before commencing a road opening activity, it is the responsibility of utility authorities to provide a "Notice of Proposed Works" to Council in accordance with the provisions of the following:

- *Electricity Supply Act 1995* (Section 45).
- *Telecommunications Act 1997* (Schedule 3).
- *Gas Supply Act 1996* (Section 47).

Such notice shall contain relevant information including but not limited to:

- *Works description.*
- *Location details.*
- *Anticipated commencement date.*
- *Proposed start/finish dates.*
- *Design* drawings.

In situations where a road opening activity has been carried out without notifying Council, the utility authority will be charged with a late fee in accordance with Council's Fees and Charges (available on Council’s website). Council shall also be notified when the original proposal has been altered.

Utility Authorities are responsible for undertaking all searches and obtaining necessary approvals associated with their proposed works. Other requirements to be addressed shall include:

- Complying with any relevant legislation.
- Environmental Impact Statement.
- Review of Environmental Factors.
- Environmental Management Plan.
- Safety requirements.
- Conditions of approval.

Utility Authorities are required to notify Council’s Representative of any proposed work and allow sufficient time for Council’s Representative to carry out detailed assessments of the proposal with respect to Council’s assets and services to the community. The utility authority is required to provide as much notice as possible with a minimum of four (4) weeks for major works and a minimum of two (2) weeks for minor maintenance work.
Council shall commence its assessment of a proposal once all relevant information is submitted. The utility authority shall be advised of the outcome and any requirements and/or conditions for the proposed works following the completion of the assessment.

The utility authority is required to take into account any issues raised, requirements and conditions of approval prior to the commencement of the proposed work.

All utility services shall be installed within the Council’s footway allocation in accordance with the NSW Streets Opening Conference 2009. Council’s Representative shall be consulted where deviation from footway allocation is unavoidable.

Utility authorities shall ensure works are being undertaken in accordance with Council’s requirements, standards and specifications for road opening and restoration. Additionally, utility authorities shall quality assure their excavation, backfilling and restoration works.

A quality assurance checklist shall be completed for the execution of all works including excavation, backfilling and restoration. Copies of quality checklists including all inspection and testing results shall be forwarded to Council’s Representative within seven (7) days of practical completion of works. At any time Council’s Representative may undertake random inspection of the works being carried out on site.

At least seven (7) days prior to commencement of physical work, the Utility Authority shall notify:

- Council’s Representative.
- All affected residential frontage properties.

Council’s Representative shall be notified immediately following the completion of all temporary and permanent restoration works.

Council shall be informed about who shall undertake permanent restoration for the proposed works. If it is decided that Council will not be undertaking permanent restoration on behalf of a utility authority, the complete permanent restoration process shall be inspected and approved by Council’s Representative. Forty-eight (48) hours’ notice is required prior to permanent restorations being undertaken. Any inspection carried out by Council’s Representative may be subject to an inspection fee.

The utility authority is required to warrant its permanent restoration for a period of twenty-four (24) months during which time Council will carry out routine defect monitoring program for all completed restorations. During this period, the repair of defects such as subsidence and surface deterioration is the responsibility of the utility authority. Where works carried out are considered by Council to be unsatisfactory, the utility authority will be given fourteen (14) days’ notice to rectify the fault. Where works are not rectified within this time frame Council may elect to undertake the rectification with costs being charged to the utility authority.

Where Council is engaged or required to undertake permanent restorations on behalf of utility authority, reinstatement orders shall be submitted to Council, immediately after completion of work. The utility authority is responsible for maintaining any temporary restoration in a safe and trafficable condition for up to a period of three (3) months after Council has been formally
engaged to undertake a permanent restoration. After which time, the maintenance of temporary restoration becomes the responsibility of Council relieving the utility authority of future liability.
A ROAD RESERVE OPENING ACTIVITY IS REQUIRED

Utility Authority submits a work notification to Council with all relevant information and drawings.

Is the notification adequate for assessment by Council?

- No
  - The complete permanent restoration process is required to be inspected and approved by Council (48 hours’ notice is required prior to permanent restoration being undertaken).
  - Utility authority continues to monitor and maintain temporary restoration in a safe and trafficable condition for 3 months.
  - Utility authority undertakes permanent restoration after the 3 months period.
  - Notify Council’s Representative immediately after completion of permanent restoration.

- Yes
  - Council’s Officers assess the notification with respect to Council’s assets and services to the community.
  - The proponent is advised of the outcome in writing at the end of Council’s assessments.

Is Council doing permanent restoration?

- No
  - Notify Council’s Representative immediately after completion of temporary restoration.
  - Utility authority ensures a quality assurance checklist is completed for all works including excavation, backfilling and restoration. Forward a copy to Council’s Representative.

- Yes
  - Utility authority submits a reinstatement order to Council immediately after completion of temporary restoration.

Is Council’s letter an acceptance response with conditions of approval?

- No
  - Utility authority takes into account any Council’s issues raised, requirements and conditions of approval.

- Yes
  - Utility authority ensures works being undertaken in accordance with Council’s requirements for road reserve opening and restoration.
  - Contact Council’s Representative to discuss about road restoration requirements.
  - Contact Council’s Representative where deviation from footway allocation is unavoidable.
  - Notify Council’s Representative and any affected property owners at least 7 days prior to commencement.

Restoration is completed. The utility authority warrants the permanent restoration for a period of 24 months (Outcome No. 3)

Restoration is completed. Council carries out Defect Monitoring Program (Outcome No. 2)

Restoration is completed.
7.4 Responsibility and Process for Private Individuals

In this Section, Private Individuals includes any Service Provider or contractor engaged to carry out the required works on behalf of a Private Individuals or other parties who are not Council or Utility Authorities.

Before commencing a road opening activity, it is the responsibility of private individuals to obtain a Road Opening permit, which is available on Council’s website. A Road Opening Permit form must be completed and associated permit fee and restoration charges shall be paid by the private individual in accordance with Council’s Fees and Charges. The permit will be valid for six (6) months from the date of issue. In situations where private individuals have carried out a road opening activity without a road opening permit, they will be charged with a late fee in addition to the standard fees and charges.

Where a road opening activity is associated with a current Development Consent, the applicant is required to complete a Roads Act 1993 application form in place of a Road Opening Permit application. A Roads Act 1993 application form is available on Council's website.

The private individual is responsible for undertaking all searches and obtaining necessary approvals associated with their proposed works. Other requirements to be addressed shall include:

- Complying with any relevant legislation.
- Environmental Impact Statement.
- Review of Environmental Factors.
- Environmental Management Plan.
- Safety requirements.
- Conditions of approval.

All utility services shall be installed within the Council’s footway allocation in accordance with the NSW Streets Opening Conference 2009. Council’s Representative shall be consulted where deviation from footway allocation is unavoidable.

The private individual is required to take into account any issues raised, requirements and conditions of approval prior to commencing a road opening activity.

The private individual shall ensure works are being undertaken in accordance with Council’s requirements, standards and specifications for road opening and restoration. The private individual shall quality assure their excavation, backfilling and restoration works.

A quality assurance checklist completed by the private individual shall be completed for the execution of all works including excavation, backfilling and restoration. Copies of quality checklists including all inspection and testing results shall be forwarded to Council’s Representative within seven (7) days of practical completion of works. At any time Council’s Representative may undertake random inspection of the works being carried out on site.

At least seven (7) days prior to commencement of physical work, the Private Individual shall notify:
• All relevant stakeholders including Council’s Representative.
• All affected residential frontage properties.

Council shall undertake all permanent restorations on behalf of the private individual. However, the private individual is required to maintain any temporary restoration in a safe and trafficable condition for a period of up to three (3) months after Council has been formally engaged to undertake a permanent restoration. After which time, the maintenance of temporary restoration becomes the responsibility of Council.

Prior to Council undertaking permanent restoration works, any temporary restoration shall be inspected by a Council’s Representative, a final measure up for permanent restoration shall be required and a restoration invoice shall be issued to the applicant.
A ROAD OPENING ACTIVITY IS REQUIRED

The applicant completes a road opening permit application form and providing all supporting documents to Council (attached a TMP, TCP, public liability insurance and drawings/sketches/plans) for ROP and ROL

Figure 7.3 Road Opening Flow Chart – Private Individuals

The proponent ensures a quality assurance checklist is completed for all works including excavation, backfilling and restoration. Forward a copy to Council’s Representative

Notify Council’s Representative immediately after completion of a road opening activity and temporary restoration.

Temporary restoration inspected by Council, a final measure up for permanent restoration is carried out and the applicant is issued with a restoration invoice.

The applicant ensures works being undertaken in accordance with Council’s requirements for road opening and restoration

Construction work commences

Notify Council’s Representative and any affected property owners at least 7 days prior to commencement.

Contact Council’s Representative where deviation from footway allocation is unavoidable.

Notify Council’s Representative immediately after completion of a road opening activity and temporary restoration.

Does Council have any objection to the proposal?

The applicant pays Council associated road opening permit fee and any Road Occupancy Licence application fee

The applicant is issued with a road opening permit.

The applicant takes into account any Council’s issues raised, requirements and conditions of approval

The applicant is issued with a road opening permit.

The applicant takes into account any Council’s issues raised, requirements and conditions of approval

Council carries out Permanent restoration on behalf of the applicant.

Council carries out Defect Monitoring Program

Restoration is completed.

ROP – Road Opening Permit

ROL – Road Occupancy Licence

TCP – Traffic Control Plans

TMP – Traffic Management Plans
7.5 Utility Service Installation within the Road

7.5.1 Allocation of Spaces in Footways

There are no allocations for utility services within road carriageways. All utility services shall be installed within the Council’s footway allocation in accordance with the *NSW Streets Opening Conference 2009*.

The first 300mm parallel to the property alignment shall be utilised at all times for the placement of utility structures such as cabinets, pillars, and pedestals in accordance with the *Streets Opening Conference 2009* unless other utility services already occupied this space.

Any above ground structure placed very close to the roadway may pose safety hazards to vehicular traffic. In no circumstance shall any above ground utility structures be installed within 500mm from the back of kerb without Council’s approval.

The Service Provider cannot utilize the Water Authority’s defined street allocation services corridor for installation of utilities infrastructure including cables, conduits, kiosks, pillars, poles, street lighting columns without written consent of the Water Authority (Central Coast Council).

Any situations where deviation from footway allocation is unavoidable, specific approval as a non-conforming application must be sought from Council’s Representative prior to commencement of works.

7.6 Services Conduits Installation

Prior to excavation of trenches for services conduits the Service Provider shall liaise with the Service Authorities and the Accredited Service Provider Contractor to confirm the servicing trench and coordination requirements of the Service Authorities.

The locations of all road crossing and longitudinal conduits and cables shall be recorded and shown on WAE drawings to be provided to Council upon request by Council’s Representative.

All services conduits, pits and other materials shall be supplied as specified by each of the Service Authorities.

The Service Provider shall set out the location of all trenching for conduits, pits and bends.

Any conflict between proposed service conduits or pits and approved civil works shall be brought to the immediate attention of Council’s Representative. Changes to approved civil works shall not be made without the acceptance of Council’s Representative.

All trenches shall be graded at a minimum of 0.5% fall, unless prior approval is given by Council’s Representative. Conduits under roads and other objects shall project at least 1000mm beyond obstructions such as kerb, subsurface drains, stormwater and water mains and otherwise clearances to obstructions are as required by the Service Authority specified by Council’s representative. The trench shall be excavated beyond these obstructions.
The installation of service conduits under existing road pavements shall be carried out by a trenchless method such as under boring unless otherwise by Council’s Representative. Full details of any road under bore must be provided to Council’s Representative for acceptance prior to any the under bore proceeding.

Conduits shall be capped with a non-perishable removable cover prior to backfilling to prevent the entry of foreign material.

Warning tape/protection mat installed above installed services, will be as specified by the utility asset owner.

### 7.6.1 Compliance Inspections and Documentation

The Service Provider shall provide copies of letters from each of the Service Authorities confirming installation relating to servicing complies with their requirements.

Work-as-executed drawings shall show the plan location and type of all service road crossings.

Compliance to this Specification is to be demonstrated during site inspections by Council’s Representative during the installation of all services conduits.

Where there is doubt that trenches in existing road pavements have not been restored in accordance with this Specification, the Service Provider will be required to core the restoration to demonstrate compliance.

### 7.6.2 Non-complying Work

Where utility service conduit installation observed by Council’s Representative to not comply with this or any section of this Specification the Service Provider shall be instructed verbally or in writing of the non-compliance. The non-complying item(s) must be required to be rectified prior to the final inspection.

### 7.7 Clearances to Council’s Underground Assets

#### 7.7.1 Water and Sewer

Minimum clearances to Council’s existing water and sewer reticulation mains shall be to Water Services Association of Australia’s (WSAA) *Water and Sewer Design Codes of Australia* standards or Council’s minimum clearance standards, whichever is greater.

The following conditions including minimum horizontal and vertical clearances to water and sewer assets have been compiled to assist utility providers with clearances required to Councils’ assets.
Table 7.1 Utility Clearances from Water and Sewer

<table>
<thead>
<tr>
<th>MAIN SIZE</th>
<th>GAS</th>
<th>TELECOMMUNICATION</th>
<th>ELECTRICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dia. (mm)</td>
<td>HOR</td>
<td>VERT</td>
</tr>
<tr>
<td>WATER</td>
<td>≤ 200</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>&gt;200≤450</td>
<td>600</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>&gt;450</td>
<td>1000</td>
<td>500</td>
</tr>
<tr>
<td>SEWER</td>
<td>≤300</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>&gt;300</td>
<td>600</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>RM≤200</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>RM&gt;200</td>
<td>600</td>
<td>150</td>
</tr>
</tbody>
</table>

A minimum 1000mm horizontal and 500mm vertical clearance apply on large major trunk mains, sewer rising mains and larger gravity mains critical to the operation of the water and sewer systems.

Utility services shall not to be installed on the same vertical alignment as the Water Authority’s main.

The proponent cannot utilise the Water Authority’s defined street allocation services corridor for installation of utility services without written consent of the Water Authority (Council).

The pipe material of Council’s assets may also present additional considerations for any proposed installation. Clearances may need to be increased to ensure disturbance does not incur damage to existing water and sewer assets. Compaction of trenching within close proximity to asbestos cement (AC) and cast iron (CICL) assets is restricted to methods not incorporating mechanical vibration.

Service poles located within 1.5m of water and sewer mains are to be embedded below the invert of the mains. Where poles are to be placed with reduced horizontal clearances to mains, placement shall not incur damage to mains or destabilisation of pipe support. Additionally, poles shall not to be placed within 1.5m of sewer maintenance structures.

7.7.2 Stormwater Drainage

Minimum clearances shall be provided to Council’s existing and/or proposed stormwater drainage assets in accordance with requirements shown in the Table 7.2 and Figure 7.4 below.
Table 7.2 Utility Clearance from Stormwater

<table>
<thead>
<tr>
<th>Council Stormwater Drainage Assets</th>
<th>Proposed Underground Utility Installations</th>
<th>Minimum Clearances* (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Sub Category</td>
<td>Ca(^1)</td>
</tr>
<tr>
<td>Pipe</td>
<td>Ø ≤ 900</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>900 &lt; Ø ≤ 1500</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Ø &gt; 1500</td>
<td>600</td>
</tr>
<tr>
<td>Box Culvert</td>
<td>Any size</td>
<td>The same as the pipe with equivalent cross sectional area</td>
</tr>
<tr>
<td>Pit/Headwall</td>
<td>Any size</td>
<td>Not Acceptable</td>
</tr>
<tr>
<td></td>
<td>Lined (concrete or similar)</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Unlined (e.g. turf or rock)</td>
<td>1000</td>
</tr>
<tr>
<td>Channel/Table Drain</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Clearance above stormwater asset
2. Clearance below stormwater asset
3. Horizontal clearance from stormwater asset, where proposed utility installation is running parallel.

Ø Internal diameter (mm);
* Measured from the external dimensions of the stormwater drainage assets.

1. **Note:** Sewer mains should be installed below stormwater to minimise the possibility of backflow contamination in the event of a main break.
2. Also, where possible, water mains should be installed above stormwater and sewer mains to minimise the possibility of backflow contamination in the event of a main break.
3. For cases where there is no alternative and the main must cross under the sewer, the design shall nominate an appropriate trenchless construction technique or other water main construction and protection treatment, effectively joint-free in the vicinity of the sewer.
4. Horizontal and vertical clearances can be further reduced to 2m for distances up to 2m, where mains are to be laid past installations such as concrete pits, service poles and small structures, providing the structures will not be destabilised in the process.
Utility services that are located within 1% AEP flood zones and/or sea level rise affected zones, consideration shall be given to minimise the hazards to community and interruption to service resulting from potential flooding and future sea level rise. Information on 1% AEP flood zones and sea level rise affected zones is available on Central Coast Council’s website.

Utility services shall not to be installed on the same vertical alignment as the existing and/or proposed stormwater drainage assets.

The section of the proposed mains, cables and/or conduits passing over the trench of the existing and/or proposed stormwater drainage conduits shall be joint free and self-supporting.

Pits, cabinets, poles, kiosks and/or substations shall not be installed within the trench of the existing and/or proposed stormwater drainage assets.

Pits, cabinets, kiosks and/or substations shall be installed outside the zone of influence of existing and/or proposed stormwater drainage assets, unless underpinning of the proposed structures are undertaken.

Poles shall be installed outside the zone of influence of existing and/or proposed stormwater drainage assets. However, if poles are to be installed within the zone of influence of existing and/or proposed stormwater drainage assets, the poles shall be installed to a depth that is below the zone of influence.

There shall be no installation of utility infrastructure within existing and/or proposed stormwater drainage easements and/or drainage reserves.

Should the clearances required for installing the proposed mains, cables and/or conduits passing over existing stormwater drainage assets cannot be met, the installation shall be below the existing stormwater drainage assets, unless prior approval has been given by Council’s Representative.

When the proposed utility mains, cables and/or conduits are concrete encased, the clearance below the stormwater asset may be reduced by the following:

- 100mm for stormwater pipes that are smaller than 1500mm in diameter or box culverts with equivalent cross sectional area.
• 150mm for stormwater pipes that are larger than 1500mm in diameter or box culverts with equivalent cross sectional area.
• 150mm for a lined channel and/or table drain.
• 300mm for a creek, unlined channel and/or table drain.

### 7.7.3 Depth of Underground Services

Generally, the minimum depth of cover for underground utility services shall be 0.60m within footways and 0.75m for trench crossings and pits within the carriageway and 0.90m for approved longitudinal trenches within the carriageway. For some utilities these depths will increase, see Table 7.3 below. All utility service providers need to be contacted to confirm their individual requirements.

<table>
<thead>
<tr>
<th>Table 7.3 Nominal Depth of Cover of Utility Service</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical</strong></td>
</tr>
<tr>
<td>LV Cable</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>HV Cable to 22kV</td>
</tr>
<tr>
<td>HV Cable 33kV and above</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
</tr>
<tr>
<td>≤ 400kPa</td>
</tr>
<tr>
<td>≥1000kPa</td>
</tr>
<tr>
<td>≥3500kPa</td>
</tr>
<tr>
<td><strong>Water main</strong></td>
</tr>
<tr>
<td>≥750mm diameter</td>
</tr>
</tbody>
</table>

**WARNING**: Table 7.3, outline the depth of underground Utilities and indicates only the depths at which the various utility providers are nominally laying services. It has been prepared for information purposes only. Existing and future services/utilities may be located at different depths from those indicated. Therefore, Service Providers intending to excavate or bore shall check with the utility providers/authority concerned before commencing work. They must exercise care in areas where utilities are indicated by the utility providers/authority and all utilities shall be located by hand excavation/non-destructive method, before any mechanical equipment is used.

### 7.7.4 Construction of Trenches

All longitudinal trenches, trench crossings and pits within the road reserve shall be constructed in accordance with Council’s *Civil Works Specification – Standard Drawings*.

Compaction and compaction testing of backfill and pavement material shall be in accordance with Table 7.4 and Table 7.5 below, which are adapted from *AUS-SPEC 1152 (Utilities)*. Council reserves the right to undertake Quality Control testing, including material compaction and thickness testing.
Table 7.4 Trenches within Footways

<table>
<thead>
<tr>
<th>TRENCH ZONE</th>
<th>ZONE THICKNESS</th>
<th>BACKFILL MATERIAL</th>
<th>COMPACTION REQUIREMENT</th>
<th>MINIMUM TESTING REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grassed:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wearing Surface (Course)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asphalt Pavement:</td>
<td>Grassed:</td>
<td>Surface shall be top dressed and turfed with turf rolls and established with appropriate watering</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WEARING SURFACE (COURSE)</td>
<td>40mm AC</td>
<td>Heavy Duty AC14 or as determined by Council’s Representative</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>100mm (path) or 125mm (vehicle accesses)</td>
<td>N25 Reinforced Concrete with SL72 mesh</td>
<td></td>
</tr>
<tr>
<td>TRENCH BACKFILL</td>
<td>600mm (min)</td>
<td>Select backfill material (sand as minimum). Not to use excavated material unless material is free draining, inorganic, free from stones larger than 100mm with the fraction passing a 19mm AS sieve having a four (4) day soaked CBR value not less than that of the adjacent select material zone in conformance with AS1289.6.1.2</td>
<td>Uniformly compact each 150mm layer over the full area and required depth within the trench to 80% relative density when tested in accordance with AS1289.5.6.1 (Density Index Method)</td>
<td>1 per 2 layers per 100 lineal metres of trench or per 20 road openings for openings of less than 10m² plan area whichever results in the most frequent testing. Testing methods shall be in accordance with AS1289.5.6.1</td>
</tr>
<tr>
<td>BEDDING ZONE</td>
<td>In accordance with Utility Authority’s Specification</td>
<td>In accordance with Utility Authority’s Specification</td>
<td>In accordance with Utility Authority’s Specification</td>
<td>In accordance with Utility Authority’s Specification</td>
</tr>
</tbody>
</table>
### Table 7.5 Trenches within Carriageways

<table>
<thead>
<tr>
<th>TRENCH ZONE</th>
<th>ZONE THICKNESS</th>
<th>BACKFILL MATERIALS</th>
<th>COMPACTION REQUIREMENT</th>
<th>MINIMUM TESTING REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WEARING SURFACE (COURSE)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flexible Pavement:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary:</td>
<td>50mm</td>
<td>AC (Hotmix only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent:</td>
<td>100mm (in 2 layers – 60mm and 40mm)</td>
<td>Heavy Duty AC14 on tack coat or as determined by Council’s Representative</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rigid Pavement:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary:</td>
<td>50mm</td>
<td>AC (Hotmix only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent:</td>
<td>Match existing thickness (like for like)</td>
<td>Doubly reinforced concrete (min N32) with SL82 mesh</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BASE COURSE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary: 250mm</td>
<td>Select Pavement Material ARRB SR41 or DGB20 or equivalent</td>
<td>Uniformly compact each 150mm layer over the full area and specified depth within the trench to a relative compaction of 98% when tested in accordance with AS1289.5.2.1 (Maximum Modified Dry Density) or 102% when tested in accordance with AS1289.5.1.1 (Maximum Standard Dry Density)</td>
<td>1 per pavement layer, per 100 lineal metres of trench or per 20 road openings for openings of less than 10m² plan area whichever results in the most frequent testing. Testing methods are to be in accordance with AS1289.5.1.1 or AS1289.5.2.1</td>
<td></td>
</tr>
<tr>
<td>TRENCH ZONE</td>
<td>ZONE THICKNESS</td>
<td>BACKFILL MATERIALS</td>
<td>COMPACTION REQUIREMENT</td>
<td>MINIMUM TESTING REQUIREMENT</td>
</tr>
<tr>
<td>-------------</td>
<td>----------------</td>
<td>-------------------</td>
<td>------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>SUBGRADE (TRENCH BACKFILL)</td>
<td>Varies</td>
<td>Select backfill material (sand as minimum). Not to use excavated material unless material is free draining, inorganic, free from stones larger than 100mm with the fraction passing a 19mm AS sieve having a four (4) day soaked CBR value not less than that of the adjacent selected material zone in conformance with AS1289.6.1.2</td>
<td>Uniformly compact each 150mm layer over the full area and required depth within the trench to 80% relative density when tested in accordance with AS1289.5.6.1 (Density Index Method).</td>
<td>1 per 2 layers per 100 lineal metres of trench or per 20 road openings for openings of less than 10m² plan area whichever results in the most frequent testing. Testing methods are to be in accordance with AS1289.5.6.1</td>
</tr>
<tr>
<td>BEDDING ZONE</td>
<td>In accordance with Utility Authority’s Specification</td>
<td>In accordance with Utility Authority’s Specification</td>
<td>In accordance with Utility Authority’s Specification</td>
<td>In accordance with Utility Authority’s Specification</td>
</tr>
</tbody>
</table>

AS1289.5.1.1:2017 – Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort.
AS1289.5.6.1:1998 (R2016) – Methods of testing soils for engineering purposes - Soil compaction and density tests - Compaction control test - Density index method for a cohesionless material.

### 7.8 Specification for Road Restoration

All longitudinal trenches, trench crossings and pits located within the road reserve shall be restored in accordance with Council’s *Civil Works Specification – Standard Drawings*.

Where paths, road pavements or vehicle access crossings are constructed from other materials such as quarry pavers, pattern pave concrete, bluestones, coloured concrete, or bricks, Council’s Representative shall be consulted regarding the restoration of these surfaces.
7.8.1 Quality Restoration Standards for Road Pavements

7.8.1.1 Flexible Pavement

- Extend restoration to a minimum of 0.20m outside excavation lines with no depression in the restoration surface. Width of remaining surface adjacent to the gutter shall be greater than 1.0m. Restoration surface shall match the road cross section.

- All joints shall be crack sealed (to a maximum of 75mm wide) and any longitudinal joints shall not be within wheel paths. There shall be no separation between joints.

- Restored trenches shall be free from broken edges and surface levels along the edges shall be flush with the surrounding pavement.

- Restoration wearing course shall be free of potholes, ravelling, rutting, shoving and any cracks greater than 1mm.

- Restore any pavement markings, signal detectors and sign posts.

- Service manholes shall be flush with surrounding pavement.

- Trench restoration shall include any saw cuts extending past the trench alignment.

- The finished surface shall be swept clean at the completion of works. All rubbish, soil and other materials resulting from the sweeping shall be removed from the site.

7.8.1.2 Rigid Pavement

- For unreinforced plain concrete, reconstruct reinforced full slab.

- Extend the reconstruction of new reinforced slab 0.5m outside excavation lines or extend to the nearest joint if the remaining dimension of slab is less than 1.0m. The concrete slab shall be doweled at 500mm centres with 20mm diameter galvanised bars along longitudinal edges.

- Restoration shall have no depression and finish surface shall match the road cross section and the surrounding surfaces.

- Surface levels along the edges shall be flush with the surrounding surfaces. Restoration surface shall be free of cracking and dusting.

- Restored trenches shall have clean saw cut edges.

- Restore any pavement markings, signal detectors and sign posts.

- Service manholes shall be flush with surrounding surface.

- The finished surface shall be swept clean at the completion of works. All rubbish, soil and other materials resulting from the sweeping shall be removed from the site.
7.8.2 Quality Restoration Standards for Paths

7.8.2.1 Concrete Pavement

- For paths with a width of 1.5m or less, slab replacement shall extend 0.2m outside excavation or to expansion joint if within 1.0m and have full depth expansion joint and 10mm diameter galvanised dowel bars at maximum 300mm centres into existing slab to both sides of trench as required.
- For paths with a width of 1.5m or less, longitudinal installations require full path replacement.
- For paths with a width greater than 1.5m, restoration of concrete surface shall extend 0.2m outside the excavation lines and in all directions. All joining faces shall have full depth expansion joints and be doweled at maximum 300mm centres with 10mm diameter galvanised bars into existing slab to both sides of trench as required.
- Restored trenches shall have clean saw cut edges with no chipping. Surface levels along the edges shall be flush with the surrounding surfaces. Restoration surface shall be free of cracking and dusting.
- Control joints shall be placed in accordance with Section 10.2.4 New Reinforced Concrete Paths.
- Service manholes shall be flush with surrounding surfaces and shall be free from concrete slurry.
- There shall be no water pooling on the restored surfaces.
- Finished surface shall be in accordance with Section 10.2.4 New Reinforced Concrete Paths.
- Surface colour to match existing colour.
- The finished surface shall be swept clean at the completion of works. All rubbish, soil and other materials resulting from the sweeping shall be removed from the site.

7.8.2.2 Asphalt Pavement

- For paths with a width of 1.5m or less, restoration shall extend to the full width.
- For paths with a width greater than 1.5m, restoration shall extend 0.2m outside the excavation lines in all directions.
- Asphalt colour coating and pattern shall match the existing pavement.
- Restored trenches shall be free of broken edges and surface levels along the edges shall be flush with the surrounding pavement.
- Restored asphalt pavement shall be free of potholes, ravelling, rutting, shoving and any cracks greater than 1mm. Restoration surface shall have no depression.
- Restore any pavement markings and sign posts.
- There shall be no separation between pavement joints.
• Service manholes shall be flush with surrounding surfaces.
• Trench cross section shall match path cross section.
• The finished surface shall be swept clean at the completion of works. All rubbish, soil and other materials resulting from the sweeping shall be removed from the site.

7.8.2.3 Grassed
• Restoration surface levels shall be flush with the surrounding path surface.
• Restoration surface shall have no depression.
• Surface shall be top dressed, turfed with turf rolls and established with appropriate watering for the entire disturbed area. Turf shall not be placed so that it causes stormwater runoff to concentrate. Turf laid adjacent to concrete works shall be laid flush with the surface of the concrete. Refer to 15.1.10 Turf requirements.

7.8.3 Concrete Vehicle Access Crossings
• Where excavation is between the path and the property boundary, the full strip panel between the property boundary and the back of path of the vehicle access crossing shall be reconstructed.
• Where excavation is within the path section of the vehicle access crossing, the full extent between the front and rear of path shall be reconstructed.
• Where excavation is within the apron of the vehicle access crossing, the full length of slab between the layback and the path shall be reconstructed.
• New concrete pavement finish shall match the existing pavement characteristics including texture, colour, pattern and joint pattern.
• The restoration surface shall have no depression.
• New concrete slab shall have full depth expansion joint and shall be dowelled at 300mm centres with 16mm diameter galvanised bars along all edges.
• Saw cuts shall be clean and straight along expansion or control joints with no chipping.
• Finish surface shall be a broom or coving trowel finish in accordance with Section 10.2.5.3 Surface Finish of this Specification.
• The profile of layback shall match Council specifications and surface finish shall be smooth steel float finish in accordance with Section 10.2.5.3 Surface Finish of this Specification.
• Any disturbed grassed area shall be restored with turf rolls and re-established.
• Service manholes shall be flush with surrounding surfaces.
• The finished surface shall be swept clean at the completion of works. All rubbish, soil and other materials resulting from the sweeping shall be removed from the site.

7.8.4 Other Assets

For other assets (such as kerbs, gutters, traffic islands and roundabouts) that are not covered in this section, Council’s Representative shall be consulted to discuss about the extent of restoration for these assets.

7.9 Additional Requirements

Where longitudinal trench wearing surfacing joints are located under a wheel path, the entire road lane is required to be resurfaced. Refer to Council’s Civil Works Specification – Standard Drawings. At intersections and roundabouts complete resurfacing may be required to avoid joints under wheel paths. Inspection of installations by Council’s Representative shall be required to determine restoration requirements. Refer to standard drawing for trenching requirements in the vicinity of roundabouts located in Civil Works Specification – Standard Drawings.

Pits and trench crossing wearing surfacing joints shall be perpendicular to traffic flow. Refer to Council’s Civil Works Specification – Standard Drawings.

Maintain connection of house stormwater pipes discharging into carriageway gutters at all times. If damaged, repair or replace to the same diameter and in a sound manner to the satisfaction of Council’s Representative. Provide a watertight seal to all joints and connections.

Council’s Road Opening Permit application form has been designed to allow applicants applying for a Road Opening permit to also apply for a Road Occupancy Licence (ROL). A Traffic Control Plan (TCP) shall be submitted with a Road Opening Permit application if the proposed works interfere with pedestrian or vehicular traffic. TCPs shall be prepared by a Roads and Maritime Services accredited Traffic Control person.

Council approval shall be obtained in the case of any modification to the approved "Notice of Proposed Works" or Road Opening Permit.

All works undertaken shall comply with the standards of the following as a minimum:

• AUS-SPEC 1152 – Road Opening and Restoration (Utilities).
• AUS-SPEC 1151 – Road Opening and Restoration.
• NSW Streets Opening Conference 2009.
• Council’s Civil Works Specification.

Where there is a discrepancy between the referenced standards, this document shall be considered as the minimum standard required. Any work or proposed work that does not comply shall be considered as non-conforming and specific approval shall be sought from Council. All non-conforming applications shall make reference to an industry standard such as AUS-SPEC 1152 or
RMS M209 Road Openings and Restoration as a minimum standard. Any proposed trenching works running adjacent to existing kerb and gutter is also considered as non-conforming.

Council may require the Service Provider to indemnify any non-conforming work (or parts of it) to ensure Council is not disadvantaged in allowing for any future road activities.

Full width or complete section replacement of the asset shall be required wherever Council considers that the road opening has compromised the integrity or operation of an existing structure.

Any conflicting utility services and survey marks both existing and proposed shall be identified and located before a Road Opening Permit shall be issued. This is the sole responsibility of the Service Provider.

It is the responsibility of the Service Provider to address all requirements associated with the proposed works such as:

- Complying with any relevant legislation.
- Environmental Impact Statement.
- Review of Environmental Factors.
- Environmental Management Plan.
- Safety requirements.
- Conditions of approval.

Considerations shall be made for issues such as:

- Sediment and water runoff control.
- Potential damage to public trees and vegetation.
- Dust and noise control.
- Public safety.

Once a road opening activity is approved by Council, the Service Provider shall be required to obtain relevant approvals from other service owners before work commences. This obligation lies entirely with the Service Provider and any damage to other services will be the sole responsibility of the Service Provider and Council will assume no liability for damage.

Should the Service Provider wish to modify the Standard Drawing(s) or propose an alternative restoration plan, a detailed design and scope of works shall need to be provided to Council’s Representative referencing all relevant sections of Council’s Civil Works Specification. It would be expected that this option would generally only be relevant for significant works involving multiple roads and extensive longitudinal trenches.

All costs associated with the opening, removal, temporary and permanent restorations of road assets will be borne by the Service Provider. Council is the preferred provider of permanent restoration following the completion of restoration works. A schedule of rates for the provision of
permanent restoration is available on Council's website or upon request from Council's Representative.
Section 8 - Flexible Pavement Construction

8.1 General

The works covered by this section of the Specification covers the construction of flexible road pavements comprising layers of pavement material placed above the subgrade or subgrade replacement surface.

The pavements covered by this section of the Specification are to be constructed in accordance with the approved pavement design report prepared by a Geotechnical Engineer and accepted by Council’s Representative or resulting from subsequent recommendations by the Service Provider’s Consulting Geotechnical Engineer due to further subgrade assessment as required during construction.

Flexible pavements layers covered by this section of the Specification may consist of:

Select layer: layer placed immediately above natural or filled subgrade.

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.

Base/Base course: One or more layers of material usually constituting the uppermost structural element of a pavement and on which the surfacing may be placed. It may be composed of fine crushed rock, natural gravel, broken stone, stabilised material, asphalt or Portland cement concrete.

Semi-rigid pavement: is where the base and/or the subbase are constructed of bound materials.

Bound material: A granular or subgrade material to which binders such as lime, cement or bitumen are added to improve structural stiffness.

Modified material: Granular materials to which small amounts of stabilising agent have been added to improve their performance (e.g. by reducing plasticity) without causing a significant increase in structural stiffness.

Wearing surface: That part of the pavement specifically designed to resist abrasion from traffic and to minimise the entry of water. This is covered in Section 12 - Bituminous Sealing and Section 13 - Asphalt Surfacing of this Specification.

8.2 Materials

8.2.1 General

Material shall be supplied to comply with the Traffic Category applicable to the pavement. Traffic categories are as defined in Annexure 3051/A of Roads and Maritime Services Specification QA 3051 Granular base and subbase materials for surfaced road pavements or the categories R1 and
R2 in the *IPWEA Specification for Supply of Recycled Material for Pavements, Earthworks and Drainage 2010* (referred to as *IPWEA Specification* from hereon).

At least fourteen (14) days prior to material placement, copies of recent test results (not more than 3 months old) of the supplied material and certification by a NATA registered geotechnical laboratory of compliance with *Roads and Maritime Services’ Specification QA 3051 Unbound and Modified Base and Subbase Materials for Surfaced Road Pavements*, or The *IPWEA Specification* shall be provided to Council’s Representative for approval.

No material shall be delivered until Council's Representative has approved the source of the material supply.

Any changes to the approved material and source shall be made in writing to Council's Representative. No delivery of material under the alternative proposal shall take place without the approval of Council's Representative. The cost of testing associated with any alternative proposal shall be borne by the Service Provider.

### 8.2.2 Select Layer Material

Approved select layer material shall be defined as fill material including sand, soil or broken rock obtained from site excavations or approved borrowed areas remote from site. Such material shall:

- Have a maximum Plasticity Index of 20 in that fraction passing the 0.425mm sieve.
- Be free of material greater than 75mm in size, contain less than 2% organic matter, and be capable of being brought to the required moisture content.
- When tested in accordance with Roads and Maritime Services’ *Test Method T117 - California Bearing Ratio of Remoulded Specimens of Road Construction Materials* following a minimum of 10 days soaking, the fraction passing 19mm AS Sieve shall have a CBR value in excess of 20.
- Select Layer material requirements shall be confirmed and nominated by the project Geotechnical Consultant. All select layer material specifications shall be submitted to Council for review forming part of the pavement design and or Geotechnical report for the project.

Approved select layer material obtained shall only be imported from sites having the necessary approvals and waste classification certification for its intended use and comply with Table 8.1 below.

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Description</th>
<th>Select Layer Material Requirements (iv)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Type CBR15</td>
</tr>
<tr>
<td>AS1289.3.1.1</td>
<td>Liquid Limit</td>
<td>Max 40</td>
</tr>
<tr>
<td>AS1289.3.4.1</td>
<td>Linear Shrinkage</td>
<td>Max 7</td>
</tr>
<tr>
<td>Test Method</td>
<td>Description</td>
<td>Select Layer Material Requirements (iv)</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>AS1289.3.6.1</td>
<td>Passing 0.075mm sieve</td>
<td>Max 45</td>
</tr>
<tr>
<td>AS1289.3.6.1</td>
<td>Plasticity Index x% Pass 0.425mm sieve</td>
<td>Max 900</td>
</tr>
<tr>
<td>AS1289.6.1.1</td>
<td>% swell in CBR test (i) (ii)</td>
<td>Max 1.0x</td>
</tr>
<tr>
<td>AS1289.6.1.1</td>
<td>4 day soaked CBR (95% modified compaction) (i) (ii) (iii)</td>
<td>Min 15</td>
</tr>
</tbody>
</table>

Notes on Table 8.1:

i  Moisture content for CBR tests are to be as follows:
   - for materials with a Unified Soil Classification of GW, GP, GC, SW, SP, SC, or CL, 2.0% (+/- 0.5%) dry of the modified optimum moisture content.
   - for materials with a Unified Soil Classification of GM or SM, 2.0% (+/- 0.5%) wet of the modified optimum moisture content.
   - for materials with dual classifications consisting of soil groups from both those listed above, one test each at 2.0% (+/- 0.5) dry and 2.0% (+/- 0.5%) wet of the modified optimum moisture content.

   The lowest CBR value of the two tests shall be taken as being representative of the material tested.

ii  The surcharge mass to be applied during soaking and testing of the test specimen shall be 4.5kg, or as determined from Figure 7 of AS1289.6.1.1 based on a wet density for the overlying materials of 2.0 t/m³.

iii  The period of soaking will be four (4) days or until swelling movements have ceased, whichever is longer.

iv  Select layer material pre-treatment:
   - Select layer material shall be pre-treated prior to testing. Pre-treatment of samples shall be carried out in accordance with the requirements of Table 8.2 and as detailed below.
   - Pre-treatment shall comprise cycles of Modified compaction in accordance with Test Method AS1289.5.2.1:2003 – Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort using the size of mould and the associated compactive effort applicable to the size and grading of the sample. The sample shall be conditioned to a moisture content between 90% to 110% of the optimum moisture content for pre-treatment. Fragments larger than 53mm in size shall be initially broken down to a size less than this value. Pre-treatment must be carried out on all materials for use in tests prescribed in Table 8.1. Pre-treatment is in addition to any compaction required for those tests. The pre-treatment, if any, must be shown on all test reports.
For fine grained and medium grained soils, as defined in AS 1289.0:2014 – Methods of testing soils for engineering purposes - Definitions and general requirements, pre-treatment shall be followed by the following:

- materials retained on the 19mm sieve shall be replaced by an equal proportion by mass of materials passing the 19mm sieve and retained on the 4.75mm sieve.
- the percentage by mass of materials retained on the 19mm sieve and the fact that it was replaced shall be included in all test reports.

AS1289.3.1.1:2009 – Methods of testing soils for engineering purposes - Soil classification tests - Determination of the liquid limit of a soil - Four point Casagrande method.
AS1289.3.4.1:2008 – Methods of testing soils for engineering purposes - Soil classification tests - Determination of the linear shrinkage of a soil - Standard method.
AS1289.3.6.1:2009 – Methods of testing soils for engineering purposes - Soil classification tests - Determination of the particle size distribution of a soil - Standard method of analysis by sieving.

Table 8.2 Sample Origin – Sampling Location – Pre-Treatment

<table>
<thead>
<tr>
<th>Sample Origin</th>
<th>Sampling Location</th>
<th>Pre-Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavated Sedimentary Rock</td>
<td>Compacted in-place materials</td>
<td>1 cycle of modified compaction</td>
</tr>
<tr>
<td></td>
<td>All other locations</td>
<td>3 cycles of modified compaction</td>
</tr>
<tr>
<td>All Other Sources</td>
<td>Compacted in-place materials</td>
<td>No pre-treatment required</td>
</tr>
<tr>
<td></td>
<td>All other locations</td>
<td>1 cycle of modified compaction</td>
</tr>
</tbody>
</table>

8.3 Construction

8.3.1 Delivery and Spreading

The pavement base, subbase and select material shall be constructed in accordance with the approved design. Council’s Representative shall approve the selection of materials to meet the required pavement composition. Pavement base, subbase and select material shall not be placed on the subgrade or underlying layers of pavement until requirements applying to those layers are met and test results confirmed.

Material shall not be placed over a layer, except for moderately to highly expansive clay sub grades, with moisture content exceeding 90% of the laboratory optimum moisture content as determined by AS1289.5.2.1 or that has become rutted or mixed with foreign matter. Moderately to highly expansive clay sub grades shall be maintained at 90 to 100% of optimum
moisture until covered by subsequent layers. If at any time the subgrade material should become rutted, or mixed with the pavement material, the Service Provider shall at his own expense remove the material, reshape and compact the subgrade and/or subbase material, and replace the pavement material with suitable fresh material.

Base, subbase and select materials, when delivered, shall have moisture contents within ± 2% of the modified optimum moisture content.

The material shall be spread in uniform layers as near as practicable to the required thickness by direct tipping from suitable vehicles or by the use of a mechanical spreader.

Spreading shall be undertaken by a method that will ensure segregation does not occur. The Service Provider shall submit full details of the proposed method of spreading for the approval of Council’s Representative at least two (2) weeks before pavement construction is commenced.

The subbase material shall be spread in uniform layers of between 100mm and 200mm to provide the compacted subbase thickness as specified on the approved drawings. The base material shall be spread in one uniform layer that will provide the compacted thickness as specified in the approved drawings.

Spreading shall be undertaken by a method which will ensure segregation does not occur and movement of material is kept to a minimum. The Service Provider shall submit full details of the proposed method of spreading for approval of Council’s Representative at least fourteen (14) days before commencement of subbase operations.

Subbase material shall not be placed on the roadway more than twenty-four (24) hours in advance of compaction.

8.3.2 Compaction and Trimming

During compaction the surface shall be kept trimmed and material added where necessary to produce a tight dense surface parallel with the finished wearing surface so that the compacted thickness of each layer is in accordance with Section 8.3.1 above

Where a course of a particular material is composed of several layers they shall be of approximately equal thickness within these limits. The surface to receive an additional layer, of similar material, shall be lightly scarified prior to placement and compaction of the following layer.

Each single layer shall be compacted so that the relative compaction over its entire area and depth meets the requirements of Section 8.4 Pavement Construction Compliance Criteria.

At the time of compaction of each layer the moisture content of the material shall be adjusted to permit the specified compaction to be attained to a moisture content between 60% and 90% of the optimum moisture content as required in Section 8.4.2 below. Material containing excess moisture shall not be compacted until it has dried out to the specified moisture content. If there is insufficient moisture in the material for it to be compacted as specified, water shall be added. No additional payment will be made for wetting or drying the material to be compacted.
Surfaces of base material (i.e. surfaces to receive a bituminous surfacing) shall be constructed slightly higher than the specified levels and cut to profile by power grader or trimming machine towards the end of the compaction process. Rolling shall then continue to produce the specified density and a tight, even surface without loose stones or a slurry of fines.

The top of the base, subbase or select material layers shall be trimmed and compacted to produce a tight dense surface parallel with the finished wearing surface so that the levels do not vary from the levels shown on the approved drawings or as determined by Council’s Representative in accordance with Table 8.4 Pavement Layer Tolerance.

Prior to placement of the next pavement layer where the material has been left for an extended period or has been subject to rain, a visual inspection including proof rolling shall be carried out by the Service Provider in the presence of the Geotechnical Consultant and Council’s Representative. Should a dispute arise regarding the adequacy of the material, additional moisture content and compaction testing shall be carried out by the Service Provider to prove compliance.

Placement of successive pavement layers shall closely follow satisfactory testing of the underlying layer. The test results for the underlying layer shall be verified for the Service Provider by the Geotechnical Consultant in writing prior to a continuation of construction of subsequent layers.

Where a layer that has been accepted by Council’s Representative and is subsequently contaminated as a result of the Service Provider’s activities, Council’s Representative may withdraw his/her acceptance of the layer.

**8.3.3 Matching to Existing Pavements**

Where the pavement is to be joined to an existing pavement it shall be done in accordance with Civil Works Specification – Standard Drawings and must not compromise ride quality.

**8.4 Pavement Construction Compliance Criteria**

**8.4.1 Compaction Requirements**

Base, subbase and select layer material shall be compacted to the following relative compaction ratios of the modified maximum dry density determined in accordance with AS 1289.5.2.1:2003 – Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort. These percentages are summarised in Table 8.3 below.

<table>
<thead>
<tr>
<th>Layer</th>
<th>Modified Maximum Dry Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base course</td>
<td>98%</td>
</tr>
<tr>
<td>Subbase course</td>
<td>95%</td>
</tr>
<tr>
<td>Layer</td>
<td>Modified Maximum Dry Density</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Select layer</td>
<td>95%</td>
</tr>
</tbody>
</table>

Proof rolling prior to compaction testing may be required to demonstrate adequate stability of the select layer material when requested by the Consulting Geotechnical Engineer or Council’s Representative. Proof rolling is not to be used as a measure that satisfactory compaction has been achieved.

**8.4.2 Moisture Content**

Base, subbase and select material shall have moisture contents in the range of 60% - 90% of the laboratory optimum maximum moisture content as determined by AS1289.5.2.1:2003 – Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort when tested for compaction.

**8.4.3 Surface Tolerances**

On completion of placement, compaction and trimming, base, subbase and select material courses shall comply with the tolerances itemised in Table 8.4 below. Surface shape shall be such that water cannot accumulate at any point.

Testing of pavement layer tolerances shall be carried out by the Service Provider in the presence of Council’s Representative at a time suitable for Council’s Representative to attend the site.

Each pavement layer is to be surveyed by the Service Provider for level and thickness conformance. Copies of this survey information shall be provided to Council’s Representative upon request.
### Table 8.4 Pavement Layer Tolerance

<table>
<thead>
<tr>
<th>Item</th>
<th>Criteria</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pavement Layers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td>Surface Level</td>
<td>± 10mm if adjacent to concrete gutter for asphalt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 10mm to 0mm if adjacent to concrete gutter for flush seals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 10mm to 0mm if no gutter</td>
</tr>
<tr>
<td></td>
<td>Thickness</td>
<td>+ 25mm to 0mm</td>
</tr>
<tr>
<td></td>
<td>Straightness</td>
<td>15mm maximum departure from 3m straight edge placed on the surface both parallel and perpendicular to the pavement centre line</td>
</tr>
<tr>
<td><strong>Subbase</strong></td>
<td>Surface Level</td>
<td>± 10mm</td>
</tr>
<tr>
<td></td>
<td>Thickness</td>
<td>+ 10mm to - 25mm</td>
</tr>
<tr>
<td></td>
<td>Straightness</td>
<td>15mm maximum departure from 3m straight edge placed on the surface both parallel and perpendicular to the pavement centre line</td>
</tr>
<tr>
<td><strong>Select material</strong></td>
<td>Thickness</td>
<td>+ 25mm to - 20mm</td>
</tr>
<tr>
<td></td>
<td>Straightness</td>
<td>20mm maximum departure from 3m straight edge placed on the surface both parallel and perpendicular to the pavement centre line</td>
</tr>
<tr>
<td><strong>Pavement Width</strong></td>
<td>Design centre line to pavement edge</td>
<td>- 0mm to + 300mm from dimensions specified</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>Average width from 3 random locations to be not less than the dimension specified</td>
</tr>
</tbody>
</table>

**Note for Table 8.4:** Tolerances apply to the top of pavement layer. Pavement layer levels are determined from design surface levels with allowance for design layer thickness or surfacing type as follows:

- For flush sealed pavements against concrete edge strips, lips of gutters etc the finished base course shall not be below the lip level, etc.
- For AC surfaced pavement the top of base course surface shall be at a depth equal to the proposed AC thickness below the design pavement surface level.
8.4.4 Surface Deflection

Council’s Representative shall determine if deflection testing is to be undertaken to ensure the constructed pavement thickness is below the maximum acceptable deflection.

Where deflection testing is required acceptable final surface Benkleman Beam deflections shall conform to the maximum permissible values in Table 8.5 below.

Council acceptance of pavement thickness designs in no way negates the maximum deflection criteria from being complied with.

Progressive Benkleman Beam Deflection testing at the top of subgrade, select and subbase layers is not required for compliance. However, as a check to ensure proposed pavement thickness above these layers will result in the required maximum acceptable deflections at the pavement surface this additional testing is recommended. The Service Provider should seek the advice of the Geotechnical Consultant in regards to this issue.

<table>
<thead>
<tr>
<th>Design Traffic (ESAs)</th>
<th>Unbound Pavement (mm)</th>
<th>Bound Pavement (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x 10^4</td>
<td>2.10</td>
<td>1.22</td>
</tr>
<tr>
<td>2 x 10^4</td>
<td>1.95</td>
<td>1.18</td>
</tr>
<tr>
<td>3 x 10^4</td>
<td>1.90</td>
<td>1.15</td>
</tr>
<tr>
<td>4 x 10^4</td>
<td>1.82</td>
<td>1.10</td>
</tr>
<tr>
<td>5 x 10^4</td>
<td>1.77</td>
<td>1.08</td>
</tr>
<tr>
<td>6 x 10^4</td>
<td>1.72</td>
<td>1.05</td>
</tr>
<tr>
<td>7 x 10^4</td>
<td>1.67</td>
<td>1.02</td>
</tr>
<tr>
<td>8 x 10^4</td>
<td>1.62</td>
<td>1.01</td>
</tr>
<tr>
<td>9 x 10^4</td>
<td>1.55</td>
<td>1.00</td>
</tr>
<tr>
<td>1 x 10^5</td>
<td>1.50</td>
<td>0.95</td>
</tr>
<tr>
<td>2 x 10^5</td>
<td>1.42</td>
<td>0.85</td>
</tr>
<tr>
<td>3 x 10^5</td>
<td>1.28</td>
<td>0.81</td>
</tr>
<tr>
<td>4 x 10^5</td>
<td>1.20</td>
<td>0.75</td>
</tr>
<tr>
<td>5 x 10^5</td>
<td>1.15</td>
<td>0.72</td>
</tr>
<tr>
<td>6 x 10^5</td>
<td>1.10</td>
<td>0.70</td>
</tr>
<tr>
<td>7 x 10^5</td>
<td>1.05</td>
<td>0.65</td>
</tr>
<tr>
<td>8 x 10^5</td>
<td>1.00</td>
<td>0.62</td>
</tr>
<tr>
<td>9 x 10^5</td>
<td>0.98</td>
<td>0.58</td>
</tr>
<tr>
<td>1 x 10^6</td>
<td>0.94</td>
<td>0.56</td>
</tr>
<tr>
<td>2 x 10^6</td>
<td>0.935</td>
<td>0.55</td>
</tr>
<tr>
<td>3 x 10^6</td>
<td>0.930</td>
<td>0.51</td>
</tr>
<tr>
<td>4 x 10^6</td>
<td>0.92</td>
<td>0.48</td>
</tr>
<tr>
<td>5 x 10^6</td>
<td>0.91</td>
<td>0.47</td>
</tr>
<tr>
<td>6 x 10^6</td>
<td>0.905</td>
<td>0.46</td>
</tr>
<tr>
<td>7 x 10^6</td>
<td>0.90</td>
<td>0.45</td>
</tr>
<tr>
<td>8 x 10^6</td>
<td>0.89</td>
<td>0.44</td>
</tr>
<tr>
<td>9 x 10^6</td>
<td>0.88</td>
<td>0.43</td>
</tr>
<tr>
<td>1 x 10^7</td>
<td>0.87</td>
<td>0.425</td>
</tr>
<tr>
<td>2 x 10^7</td>
<td>0.84</td>
<td>0.395</td>
</tr>
</tbody>
</table>
8.4.5 Ride Quality

The pavement wearing course shall have a smooth longitudinal surface profile without obvious irregularities, subject to the satisfaction of Council’s Representative – refer to Table 8.6 for surface straightness testing requirements. Any non-conformities shall be rectified by the Service Provider before acceptance of the works by Council’s Representative.

8.5 Compliance Testing and Sampling Requirements

8.5.1 General

Testing requirements for flexible pavement works shall be in accordance with this Specification. However, some pavements for major access roads, industrial subdivisions and commercial access roads may be subject to a site specific specification for testing. Site specific requirements will be contained in the Council accepted pavement design documentation or other approved documentation relating to the particular pavement.

A Consulting Geotechnical Engineer shall be employed by the Service Provider to carry out all testing and inspecting, other than tolerance testing, required to confirm materials and construction compliance for flexible pavements and any other specification required by the Consulting Geotechnical Engineer. The Consulting Geotechnical Engineer shall hold a current NATA Registration for the relevant tests. All test results certificates/reports shall be forwarded to Council’s Representative.

For all Flexible Pavement testing the Consulting Geotechnical Engineer shall determine the location where sampling and testing will be taken in accordance with the location and frequency of testing requirements in Table 8.6 - Pavement Construction Test Methods and Frequency of Testing below. This shall be carried out independently of any advice or request by the Service Provider responsible for the works.

8.5.2 Materials

Pavement material test results from a NATA registered organisation confirming that the material to be supplied to the site complies with this Specification shall be provided to Council’s Representative prior to the use of the material on site. These test results shall not be more than 3 months old.

Site testing for compliance of materials that have been delivered to site and placed will be limited to the following:

- Particle size distribution, plasticity index, liquid limit and plastic limit for subbase and base layer materials.
- Plasticity index, liquid limit, plastic limit, linear shrinkage and four (4) day soaked CBR for select layer material.

Testing shall be carried out at the frequency shown in Table 8.6 - Pavement Construction Test Methods and Frequency of Testing below. Full testing of material quality requirements may be
requested to confirm total compliance in the case that the Consulting Geotechnical Engineer and Council’s Representative consider this necessary.

### 8.5.3 Relative Compaction

All flexible pavement layers shall be tested for relative compaction to the full depth of the layer. Where a pavement layer is made up of a multiple courses each course shall be tested separately.

A minimum of two (2) tests per course of compacted pavement material shall be carried out for any road less than fifty (50) metres in length or section of pavement construction less than fifty (50) metres in length.

The requirement for relative compaction testing may be relaxed by Council’s Representative on small road shoulder type construction for a single residential lot where the width of the new pavement is less than 1.0m or where new kerb and gutter is founded on an existing compacted pavement of layer of 150mm thickness or more.

### 8.5.4 Deflection

When requested by Council’s Representative tests to determine final surface deflections shall be carried out for all new pavements.

### 8.5.5 Frequency and Location of Testing

The frequency of testing shall be appropriate to verify conformity and shall not be less than that stated in Table 8.6 below or as described below unless otherwise approved by Council’s Representative. If Table 8.6 does not cover a particular situation the Consulting Geotechnical Engineer in consultation with Council’s Representative shall specify the required frequency of testing.

#### Table 8.6 Pavement Construction Test Methods and Frequency of Testing

<table>
<thead>
<tr>
<th>Item or Characteristic to be Tested</th>
<th>Test Methods for Compliance</th>
<th>Frequency of Testing (whichever results in the most tests)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subbase and base pavement material quality conforming to RMS – Pre-Supply Testing</td>
<td>In accordance with tests specified in RMS QA 3051 or the IPWEA Specification</td>
<td>Test results that are less than 3 months old from each material supplier for each material to be supplied</td>
</tr>
<tr>
<td>Subbase and base pavement material quality – Initial Testing refer to 8.5.2 above</td>
<td>In accordance with tests specified in RMS QA 3051 or the IPWEA Specification</td>
<td>1 per pavement layer for every 200 linear metres of pavement or 1 per layer for each road greater then 50m length</td>
</tr>
<tr>
<td>Subbase and base pavement material quality conforming to RMS – Full Testing refer to 8.5.2 above</td>
<td>In accordance with tests specified in RMS QA 3051 or the IPWEA Specification</td>
<td>When required by Consulting Geotechnical Engineer or Council’s Representative</td>
</tr>
<tr>
<td>Item or Characteristic to be Tested</td>
<td>Test Methods for Compliance</td>
<td>Frequency of Testing (whichever results in the most tests)</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Select material quality – Pre-Supply Testing</td>
<td>In accordance with tests in Table 8.1</td>
<td>Test results that are less than 3 months old from each material supplier for each material to be supplied</td>
</tr>
<tr>
<td>Select material quality – On- Site Testing</td>
<td>In accordance with tests in Table 8.1</td>
<td>1 per every 200 linear metres of pavement or one for each road greater then 50m length</td>
</tr>
<tr>
<td>Modified maximum dry density and optimum moisture content for each different pavement material type</td>
<td>AS1289.5.2.1</td>
<td>1 test for each different material type or as required by the GITA</td>
</tr>
<tr>
<td>Relative compaction and moisture content for each course placed within a layer of pavement material</td>
<td>AS1289.5.4.1, AS1289.5.3.1, AS1289.5.8.1, AS1289.5.7.1</td>
<td>Locations of tests to be determined as described in section 8.5.6 below by ‘roll of a dice’ method.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 tests in sections of pavement or roads less than 50m long.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 tests in sections of pavement or roads between 50m and 85m long.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For roads or sections of pavement greater than 85m length generally 1 test in the first 12m by chainage, the next test in next 10m to 60m after the first, then tests at 50m intervals following until a test within the last 60m of the road, then a test with the last 12m.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 additional test in each turning head or cul-de-sac</td>
</tr>
<tr>
<td>Surface straightness and level (see note)</td>
<td>Deviation from 3m straight edge</td>
<td>1 test per minimum 20m linear metres</td>
</tr>
<tr>
<td>Deflection</td>
<td>AGPT05-11</td>
<td>Tests in alternative wheel paths at maximum 20m intervals both sides of the road</td>
</tr>
</tbody>
</table>

**Note:** This test is not required to be carried out by the Consulting Geotechnical Engineer. The Service Provider is to carry out this test in the presence of Council’s Representative.

- AS1289.5.2.1:2003 – Methods of testing soils for engineering purposes – Soil compaction and density tests - Determination of the dry density / moisture content relation of a soil using modified compactive effort.
AS1289.5.3.1:2004 – Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of the field density of a soil - Sand replacement method using a sand-cone pouring apparatus.

AS1289.5.4.1:2007 – Methods of testing soils for engineering purposes - Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio.

AS1289.5.7.1:2006 – Methods of testing soils for engineering purposes - Soil compaction and density tests - Compaction control test - Hilf density ratio and Hilf moisture variation (rapid method).

AS1289.5.8.1:2007 – Methods of testing soils for engineering purposes - Soil compaction and density tests - Determination of field density and field moisture content of a soil using a nuclear surface moisture density gauge - Direct transmission mode.


8.5.6 Determination of Relative Compaction Test Locations

The location of relative compaction tests for road pavements shall be determined in accordance with RMS Specification Q6 as detailed below unless another random selection process has been approved by Council’s Representative.

The validity of lot testing depends on and requires the random selection of test site locations. At the start of the selection process, every point in the lot must have an equal chance of being selected. Test site selection is to be in accordance with RMS Specification Q6, Annexure L3, and is to be prepared and calculated carried out by the laboratory. Laboratories must be able to demonstrate their random site selection process conforms to Specification Q6, L3.

8.5.7 Non-complying Tests and Retesting Requirements

8.5.7.1 General

A non-compliance report shall be submitted to Council’s Representative for any non-complying works that the Service Provider is requesting acceptance of. This report shall contain information in support of the request. Work shall not proceed further on any non-complying item until Council’s Representative has considered the non-compliance and approved the works to proceed.

8.5.7.2 Non-complying Tolerances

In the case of non-complying tests for straightness the Service Provider shall immediately rectify the non-compliance and retest the entire area of rework prior to covering up of the subject area.

In the case of non-compliant level tolerances the Service Provider shall rectify the non-compliance and re-level the entire area of rework prior to covering up. All complying levels shall be confirmed by level checks by the Service Provider on each pavement layer which shall be provided to the Council’s Representative.
8.5.7.3 Non-complying Relative Compaction and Moisture Test Results and Retesting Requirements

Where relative compaction and moisture content does not comply on the basis of test results the Service Provider shall rework the layer or course for a length of twenty-five (25) metres either side of failed test location for the full width of the pavement.

Retesting of the reworked area shall be carried out in accordance with the requirement for testing a 50m or shorter road as described in this Specification. If the failed test is in a fifty (50) metres or shorter section of pavement or the road is shorter than fifty (50) metres then the whole length of the section or road shall be reworked and retested in accordance with this Specification. Locations for retests shall be determined by ‘roll of the dice’ methods as described in this Specification. Test certificates for retests shall clearly state that they are retest of a particular test and provide details of that particular test.

8.5.7.4 Non-conforming Material

All non-conforming material as determined by testing shall be removed and replaced with conforming material. Additional testing may be carried out by the Service Provider to determine the extent of the non-complying material. The extent of this testing will be at the discretion of the Service Provider. However until additional test results that may isolate a non-compliant material to a particular area are provided to Council’s Representative all material of the type on the site will require removal.

8.5.7.5 Non-conforming Deflection Tests

When a deflection test fails to meet the maximum deflection test criteria, treatment of the failed section shall be deemed as a length of twenty-five (25) metres either side of the failed test location. This fifty (50) metre length of pavement shall be treated, reworked or reconstructed as determined by the Service Provider in consultation with the Consulting Geotechnical Engineer.

Retesting will be required to demonstrate the failed section achieves the maximum deflection criteria.

8.6 Compliance Inspections and Documentation

The Service Provider shall provide copies of:

- All pavement compaction tests and retests, material tests, Benkelman beam test certificates and reports as required by this section of the Specification.
- Service Provider’s level tolerance survey on top of subbase and base.

Compliance to this Specification is to be demonstrated during site inspections by the Accredited Certifier or Council’s Representative during the construction of flexible pavements.

8.7 Opening of Base, Subbase and Select Material Layers to Traffic
The flexible pavement shall not be opened to traffic, other than construction traffic, until the specified bituminous surfacing has been completed, unless otherwise by Council’s Representative. If the base layer of pavement is approved to be opened before final surfacing, it shall be surfaced first with a suitable temporary seal or primer seal. Any damage to the seal prior to placement of asphalt will require resealing of the damaged area. Any requirement for resealing will be determined by Council’s Representative.
Section 9 - Standard Pavements and Other Pavement Requirements

9.1 General

This section covers the construction requirements for pavements to be constructed in accordance with Council’s Civil Works Specification.

9.2 Standard Pavement

9.2.1 Flexible Pavement for Road Shoulder, Half Road and Kerb and Gutter

This section applies to pavement design up to 40m in length and 3m in width.

Where no pavement design has been prepared, Council’s Representative may give approval for use of the following standard flexible pavement configurations on access streets. Refer to Table 6.1 Road Hierarchy and Road Width Schedule in the Civil Works Specification – Design Guideline for road classification details.

Flexible pavement materials and construction shall conform to the requirements of Section 8 - Flexible Pavement Construction for material quality and testing unless otherwise approved by Council’s Representative.

9.2.1.1 Standard Flexible Pavement – Sand/Silty Sand Subgrade

CBR Greater than or Equal to 7.0

- Subgrade greater than or equal to CBR 10.0
- 150mm thick subbase
- 120mm thick base
- Single coat 10mm seal
- 30mm AC10

9.2.1.2 Standard Flexible Pavement – Sandy Clay/Clayey Sand/Clay Subgrade

CBR Greater than or Equal to 3.0

- Subgrade greater than or equal to CBR 3.0
- 300mm thick subbase
- 120mm thick base
- Single coat 10mm seal
- 30mm AC10
For subgrades with a CBR less than 3.0 a Consulting Geotechnical Engineer shall be engaged to recommend treatment or replacement options to modify the subgrade which result in a subgrade CBR equal to or greater than 3.0.

9.2.2 All Weather Surface

Where the approved drawings or conditions of Development Consent require an “all weather surface” or “all weather pavement” the following minimum construction is required:

- The width of the pavement shall be a clear 4m unless otherwise shown or conditioned.
- Surface crossfall shall be one way and vary between 2% and 6% to suit the topography, 4% is desirable.
- The pavement shall consist of a minimum 200mm thickness of compacted road base material complying with Section 8 - Flexible Pavement Construction. The use of alternative road base materials shall require acceptance by Council’s Representative.
- The road base shall be founded on a subgrade meeting the requirements of Section 5 - Site Clearing and Bulk Earthworks. The subgrade shall be proof rolled and inspected by Council’s Representative.
- The surface shall be sealed with a minimum single 10mm seal for the full 4m width or other width as approved or conditioned.
- Table drains, cross drains and piped culverts are to be provided where shown on the approved drawings or where required on site to provide a runoff regime similar to that of the pre-construction site condition.
- All drains, stormwater inlets and outlet areas shall be adequately stabilised and disturbed areas revegetated.

9.2.3 Residential Lot Battle-Axe Handle Driveway Pavements

Where required on the approved drawings or required in the conditions of consent, residential lot battle-axe handles shall be constructed with a concrete pavement with the following minimum standard of construction. In the case that a higher standard of construction is nominated on the drawings then the standard on the drawings shall be adopted.

The vehicle access crossing located within the road reserve or proposed road reserve shall be constructed in accordance with 10.2.5 Vehicle Access Crossings of this Specification and Council’s Civil Works Specification – Standard Drawings.

9.2.4 Rural Area Vehicle Access Crossings

Rural vehicle access crossings may be constructed in flexible pavement in accordance with 9.2.1 above. The pavement shall extend to the existing road pavement and the seal coat shall overlap the existing road pavement seal. The access shall be adequately drained to prevent stormwater runoff onto the public road.
9.2.5 Compliance Inspections, Testing and Documentation for Standard Pavements

Construction compliance shall be demonstrated during inspections by Council’s Representative and the following details provided:

- Relative compaction testing in accordance with Section 5 - Site Clearing and Bulk Earthworks (subgrade).
- Relative compaction testing in accordance with Section 8 - Flexible Pavement Construction (road base and subbase).
- Material quality tests from the supplier when requested by Council’s Representative.
- Copies of delivery receipts confirming the material type supplied when requested.
- Results required by concrete batching plants for conformance with Australian Standards.

Council’s Representative may request sampling and testing for determination of concrete strength or other nominated properties to confirm the strength grade or properties of the concrete being provided, or where the Service Provider proposes to open the pavement to traffic prior to concrete reaching its full twenty-eight (28) days strength.

9.3 Other Pavements

9.3.1 Rigid Pavements

Designs and construction specifications for rigid pavements not covered by this Specification shall be provided by the Service Provider and approved by Council’s Representative.

The construction specification for a rigid pavement shall need to have consideration for the type and location of the rigid pavement. However, the specification shall include but not be limited to:

- Concrete materials, admixtures, mix requirements and concrete property requirements.
- Jointing requirements including time frames for provision of saw cuts and sealant requirements.
- Site testing requirements to confirm compliance of the specified concrete.
- Placing, finishing and curing requirements.
- Construction tolerance.
- Opening to traffic.

9.3.2 Compliance Inspections and Reporting and Testing for Rigid Pavements

Council’s Representative will inspect the works at various stages to confirm general compliance with the accepted design and specification. The Service Provider’s Consulting Geotechnical Engineer shall carry out inspections at the following stages and certify compliance with the design and specification:
- Subgrade preparation.
- Forming and placement of reinforcing steel (if applicable) and set up for joints in subbase.
- Finished subbase.
- Forming and placement of reinforcing steel (if applicable) and set up for joints in base.
- Finished base including sealed joints.
- Completion of all concrete testing confirming concrete property requirements.

Certificates confirming compliance at the above stages shall be submitted to Council’s Representative upon completion of the stage. Regardless of a certificate being issue by the Consulting Geotechnical Engineer at any of the above stages Council’s Representative may reject the works if non-complying work has been observed.

All cracked or damage concrete shall be removed and replaced to the extent as directed by Council’s Representative following consultation with the Service Provider’s Consulting Geotechnical Engineer.

When requested results of compliance testing in accordance with AS1379:2007 – Specification and supply of concrete as carried out by the concrete supplier shall be provided to Council’s Representative in addition to specified site and project testing contained in the accepted specification.

A Testing Authority shall be employed by the Service Provider to carry out all testing required by the accepted specification and any additional testing requested by Council’s Representative. The cost of any additional testing requested shall be met by the Service Provider. The Authority shall hold a current NATA Registration for the relevant tests. A copy of all test results shall be provided to Council’s Representative.

### 9.3.3 Heavily Bound Pavements

Heavily Bound Pavements where nominated for use shall be constructed in accordance with the approved Pavement Design Report and construction specification prepared by the Service Provider’s Consulting Geotechnical Engineer which has been approved by Council’s Representative.

Specifications for the supply and placement of the heavily bound materials shall be based on Roads and Maritime Services’ QA 3051 – Granular Base and Subbase Materials for Surfaced Road Pavements and Roads and Maritime Services’ R75 In situ Pavement Stabilisation Using Slow Setting Binders. All clarifications for the supply and placement shall be contained in the approved Pavement Design Report.

Compliance testing requirements for the supply and placement of heavily bound base shall be contained in the approved Pavement Design Report or nominated by Council’s Representative in the pavement report acceptance.
9.3.4 Full Depth Asphalt Pavements

Full depth asphalt (FDA) pavement construction and materials shall comply with the technical requirements of Roads and Maritime Services Specification R116 – Heavy Duty Dense Graded Asphalt. Testing in accordance with R116 shall be carried out to verify compliance unless otherwise specified in the approved pavement design report. FDA pavements shall be constructed in accordance with the thickness design contained in the approved pavement design report.

9.3.5 Interlocking Segmental Block Pavements

Interlocking segmental block pavements shall be detailed on the approved drawings. Should a design not be available the Service Provider shall arrange a design prepared by a suitably qualified Civil Engineer.

Interlocking segmental block pavements shall be designed and constructed in accordance with Guides published by the Concrete Masonry Association of Australia, Section 7.9 Interlocking Segmental Block Pavement Design from Council’s Civil Works Specification – Design Guideline and Standard Drawings.

9.3.6 Concrete Thresholds and Access Ways

Raised concrete thresholds, flush concrete threshold and access ways shall be a minimum 170mm thick, reinforced with SL82 mesh and constructed in accordance with the geometry and details shown on the approved drawings.

All concrete used in concrete thresholds or access ways shall be standard strength grade N32 in accordance with AS1379:2007 – Specification and supply of concrete.

All concrete used in thresholds or access ways shall be cured using a compound complying with AS3799:1998 – Liquid membrane-forming curing compounds for concrete which is applied to the surface of the fresh concrete.

Damaged or cracked concrete in all concrete thresholds shall be removed and replaced prior to the final inspection.

The proposed jointing layout and type of jointing shall be constructed in accordance with the approved construction drawings unless otherwise instructed by Council’s Representative.

9.3.7 Alternative Pavements

Pavements other than those covered by this Specification may be considered. Details of full pavement design by a Consulting Geotechnical Engineer with material specification and proposed compliance testing shall be submitted to Council’s Representative for approval at the design approval stage.
Section 10 - Minor Concrete Works

10.1 General

The works covered by this section of the Specification comprise of the construction of various concrete elements which include concrete kerbs, kerb and gutter of various cross sections, mower strips and edging, vehicle access crossings, kerb ramps, dish gutters, dished crossings, concrete paths, small open drains and other minor concrete paving.

Standard Drawings relating to this section of the Specification are contained in Civil Works Specification – Standard Drawings. Any variations to the requirements of the Standard Drawings must be accepted by Council’s Representative.

The Service Provider proposing to construct the elements of work described in this section of the Specification must conform to all requirements of this Specification including but not limited to:

- Contacting Council’s Representative to arrange a site meeting prior to the commencement of any works at least 5 days prior to the proposed commencement of works.
- Prepare and submit to Council’s Representative a Traffic Control Plan, as required by Section 4 - Traffic Management of this Specification.

Failure to comply with these requirements and others contained in this Specification and any additional requirements of Council’s Representative will in most cases result in the works being deemed non-compliant. In cases of non-complying work the Service Provider shall be required to remove the non-complying work and reinstate the site to its original condition.

Where the Service Provider is in doubt about the expected finished quality of works they shall seek clarification from the Council’s Representative.

10.1.1 Material Requirements

10.1.1.1 Subbase and Base Course Materials

Where nominated on the Standard Drawings the subbase and base material shall comply with the requirements of Section 8 - Flexible Pavement Construction.

10.1.1.2 Concrete

Concrete complying to AS1379:2007 – Specification and supply of concrete shall be supplied to site for the various concrete elements as specified below.

For machine slip formed or extruded kerb, kerb and gutter, edging, V-drains and dish drains laid on flexible pavement materials, the concrete shall have the following requirements:

- Minimum concrete strength grade of N25.
- Minimum effective Portland cement content 280kg per cubic metre.
- Slump to be generally 10mm to 40mm depending on machine requirements.

For formwork formed kerb, kerb and gutter, edging, V-drains and dish drains laid on flexible pavement materials, the concrete shall have the following requirements:
  - Minimum concrete strength grade of N25.
  - Minimum effective Portland cement content 280kg per cubic metre.
  - Slump shall generally be 70mm to 80mm or as required by Service Provider to achieved surface finish equivalent to a smooth steel trowel type surface.

For paths (cycleways, footpaths and shared paths), median infill, kerb ramps, edge strips and vehicle access crossings, the concrete shall have the following requirements:
  - Minimum concrete strength grade of N25 where the element is reinforced.
  - Minimum concrete strength grade of N32 for reinforced industrial vehicle access crossings.
  - Minimum effective Portland cement content 280kg per cubic metre.
  - Air entrainment shall be between 4.5% and 5.0%.
  - Maximum slump 80mm.
  - Kerb ramps shall be integrally coloured minimum concrete strength grade of N32 and reinforced in accordance with the Standard Drawings.

For open reinforced concrete drains sprayed or hand placed, the concrete shall have the following requirements:
  - Minimum concrete strength grade of N25.
  - Minimum effective Portland cement content 280kg per cubic metre.
  - Air entrainment shall be between 4.5% and 5.0%.
  - Maximum slump 80mm or as required by Service Provider for spraying.

For footings for small signs, utilities plant, fence post backfill and other minor works, the concrete shall have the following requirements:
  - Minimum concrete strength grade of N25.
  - Minimum effective Portland cement content 270kg per cubic metre.
  - Air entrainment shall be between 4.5% and 5.0%.
  - Maximum slump 80mm.

For kerb, kerb and gutter, edging and V-drains, hand placed or slip formed, tied or untied along the edge of rigid pavement concrete base, unless otherwise specified in the accepted rigid pavement design, the concrete shall have the following requirements:
  - Minimum concrete strength grade of N32.
  - Minimum effective Portland cement content 320kg per cubic metre.
  - Slump as required by Service Provider to achieve surface finish equivalent to a smooth steel trowel type surface but not greater than 80mm.
10.1.1.3 Reinforcement

Steel reinforcement shall comply with AS/NZS4671:2001 – Steel reinforcing materials as appropriate.

Where specified, galvanising shall comply with AS/NZS4680:2006 – Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.

Reinforcement shall be placed in accordance with the approved drawings or in Council’s Civil Works Specification – Standard Drawings.

10.1.1.4 Joint Fillers and Sealers

Joint fillers and sealers shall be proprietary products specifically made for the purpose being used. Details of proposed products to be used or already used shall be provided if requested by Council’s Representative. Should a product already used be confirmed as not being suitable for the situation it has been used, then the work containing the filler or sealer shall be deemed not to comply and shall be replaced with a suitable product.

10.1.1.5 Curing Compound

Curing Compounds shall comply with AS3799:1998 – Liquid membrane-forming curing compounds for concrete and must be either:

- Wax emulsion complying with AS3799 Type 1; or
- A hydro carbon resin compound complying with AS3799 Type 1-D.

Wax emulsion curing compounds shall not be used on areas subject to pedestrian traffic.

10.1.2 Earthworks and Surface Preparation

Earthworks and preparation of surfaces shall be as specified in Section 5 - Site Clearing and Bulk Earthworks of this Specification.

Where earthworks are required within the road reserve excavated material shall not be deposited on existing grassed areas or pedestrian routes without prior approval from Council’s Representative.

Subgrade, subbase and base material compaction under kerbs, kerb and gutters, V-drains, dish drains or other concrete elements along the edge or within flexible pavement areas shall be in accordance with the requirements of Section 8 - Flexible Pavement Construction of this Specification. A minimum of 150mm thick compacted subbase quality material shall be placed under all concrete elements in these locations.

Subgrade, subbase and base material compaction under V-drains, dish drains, paths, cycleways, vehicle access crossings not along the edge or within flexible pavement areas shall be compacted to a relative compaction of 100% standard maximum dry density for the full depth of the layer. A minimum 75mm thick compacted layer of road base material shall be placed under all concrete elements unless approved by Council’s Representative or otherwise shown in Council’s Civil Works Specification – Standard Drawings.
10.1.3 Concrete Works – General Requirements

10.1.3.1 Set out and Forming

All concrete elements covered by this section of the Specification shall be set out on site and formed in accordance with the proposed line and level shown on the approved drawings.

Formwork shall comply with AS3610 – Formwork for concrete and be fixed firmly in place. Forms shall extend for the full depth of the concrete and minimise spillage of unformed concrete from below the form. Excessive unformed spillage shall be removed once the concrete has reached initial set.

Where a concrete element has been formed by extrusion or slip form from a purpose made machine all excess concrete spilt beyond the required shape shall be trimmed once the concrete has reached initial set.

10.1.3.2 Removal of Forms

The Service Provider shall maintain all forms in place until the concrete is hardened enough to withstand formwork movement and removal without damage.

The following are the minimum periods, or as extended by the Council’s Representative, if air temperature falls below 10°C, which forms shall be kept in place after placement of concrete:

**Footpaths, driveways and similar:** 2 days

**Sides of reinforced concrete walls when height of each day pour is:**

- Under 0.6m: 1 day
- 0.6m to 3m: 2 days
- 3 m to 6 m: 3 days
- 6 m to 9m: 5 days

**Supporting forms under deck slabs of culverts:** 10 days

In case of concrete containing special additives, conform to stripping times as specified by the Structural Design, manufacturer’s recommendation and if required by the Council Representative.

Forms shall be removed in such a way so that the concrete will not be cracked, chipped or otherwise damaged. Crowbars or other levering devices exerting pressure on the fresh concrete to loosen the forms shall not be used.

Hole-formers such as pipes and bars shall be removed as soon as the concrete has hardened sufficiently for this to be done without damage to the concrete.

10.1.3.3 Repair of Defects

As soon as the forms are removed from mass or reinforced concrete work, the Service Provider shall repair all rough places, holes and porous spots by removing defective work and after wetting, filling with stiff cement mortar having the same proportions of cement and fine aggregate as used
in the concrete, and bring to an even surface with a wooden float. Similarly, the Service Provider shall repair all cavities caused by removal of fitments or tie wires and pack with cement mortar.

The Service Provider shall cut back any tie wires or other fitments extending to outside surfaces after removal of forms, to a depth of at least 40mm with sharp chisels or cutters.

If required, the Service Provider shall coat the surfaces of bolt cavities, tie wire holes, and all defects prior to the placing of mortar, grout, or fresh concrete, with an approved bonding agent, in lieu of wetting with water, generally as required by the manufacturer.

10.1.3.4 Removing Existing Concrete Works

Where existing concrete elements are required to be removed they shall be saw cut square and vertical at the limit of the required removal. A full depth expansion joint shall be constructed where new concrete meets the existing concrete.

10.1.3.5 Placement of Reinforcement

Reinforcing steel shall be placed on full plastic chairs to achieve a minimum cover of 30mm to the exposed finished surface of the concrete and 40mm to the slab edge or a formed joint. Sufficient chairs shall be placed so the steel maintains cover during placement of the concrete.

Lap splices in reinforcing shall be in accordance with AS3600:2009 – Concrete structures, or as shown on the approved drawings or manufacturer’s recommendations.

10.1.3.6 Handling and Placing of Concrete

Concrete shall be placed and finished to:

- Limit segregation or loss of material.
- Limit premature stiffening.
- Result in dense homogeneous hardened concrete which is monolithic between joints and edges.
- Expel entrapped air and result in a dense material around all reinforcement and embedments.
- Result in the specified thickness and surface finish.

Subbase or base material onto which concrete shall be placed shall be dampened prior to placement of concrete to reduce loss of water from the placed concrete.

Concrete shall not be placed:

- During rain or when rain is predicted.
- When the air temperature in the shade is below five degrees Celsius (5°C) or above thirty-eight degrees Celsius (38°C).

In the case that concrete has been placed and the likelihood of rain has become evident since the start of placement the Service Provider shall take measures such as covering the concrete with
plastic sheeting to avoid rain damage. Rain damaged concrete shall not be accepted as complying with this Specification.

10.1.3.7 Finishing of Unformed Surfaces
Finishing of unformed surfaces in all cases shall achieve:

- The dimensions and grades shown on the approved drawings and indicated in Council’s Civil Works Specification – Standard Drawings.
- Minimum cover to reinforcement.
- The specified surface finishes for the element being constructed.
- Minimisation of plastic and drying shrinkage cracking.

10.1.3.8 Concrete Joints
Concrete placement may include the following types of joint:

- Control joints (shrinkage/contraction joints) – formed joint with shear key or weakened plane joint.
- Expansion joints (dowelled).
- Isolation joints.
- Construction joints.
- Tied joints between existing and new concrete elements.

Full depth expansion joints shall be provided when any concrete element abuts another concrete element, for example a joint between a vehicle access crossing and kerb and gutter, a joint between a dished crossing and a drainage pit, and a joint between a concrete path and utility pit.

All concrete joints shall be constructed and positioned in accordance with Council’s Civil Works Specification – Standard Drawings. Alternative methods of achieving shrinkage control joints may be proposed by the Service Provider for approval by Council’s Representative.

Unplanned cracking in concrete shall not be accepted.

10.1.3.9 Curing
The use of curing compounds shall comply with Section 10.1.1.5 above. Where concrete elements are cured with a commercial curing compound, the concrete shall be cured and applied at the rates recommended by the manufacturer’s specifications.

10.1.3.10 Bedding Base / Subbase Tolerances
Base or subbase layers alongside or within the flexible pavement areas shall have tolerances in accordance with Section 8.4.3 of this Specification.

Base layers in other locations shall have the following tolerances:
• The level shall not deviate by more than 10mm above or 25mm below the design surface level less the allowance for the proposed concrete thickness.
• The thickness shall not be less than the specified thickness.
• The straightness shall not deviate by more than 10mm from a 3m straight edge.
• Deviations on vertical or horizontal curves shall not exceed 10mm from the true vertical or horizontal alignment.

10.2 Specific Concrete Element Requirements

10.2.1 Kerbs, Kerb and Gutter, Unreinforced Dish Drains and Unreinforced V-drains

10.2.1.1 Set Out and Forming
Kerbs, kerb and gutter, unreinforced dish drains and V-drains shall be set out to the line and level shown on the approved drawings, or where replacing existing elements to the same line and level as the existing elements, unless otherwise on the approved drawings, or otherwise directed by Council’s Representative.

Isolated lengths up to forty (40) metres on any project may be formed using formwork. For lengths exceeding this length a purpose made slip form or extrusion machine shall be utilised.

The shape of the required element shall be in accordance with Council's Civil Works Specification – Standard Drawings.

10.2.1.2 Surface Finish
A finish equivalent to that achieved with a smooth steel trowel shall be achieved.

Additional water shall not be added to the surface of any concrete in order to achieve the required smooth finish.

Additional water shall not be added to the surface of slip formed or extruded elements for finishing purposes. Extrusion machines may utilise a slurry box to aid in achieving the required finish.

10.2.1.3 Joints
Full depth expansion joints shall be placed:

• At tangent points of curves of less than 25m radius.
• Where the concrete element abuts any other concrete elements or structures.

Shrinkage control joints shall be placed at maximum 3m centres. Joints in these elements when tied to a rigid pavement shall be in accordance with the requirements of the rigid pavement design. Joint locations shall match those in the adjoining rigid pavement if no requirements are specified.

10.2.1.4 Stormwater Pipe Outlets in Kerb and Gutter
See Section 6.11 Stormwater Outlets to Kerb and Gutter.
10.2.1.5 Kerb Survey Marks
Existing survey marks shall not be disturbed. Where existing kerb and gutter is to be reconstructed the Service Provider shall be responsible for the replacement of any disturbed marks to the conditions of the Surveyor General’s Approval to Remove Survey Marks using a Registered Land Surveyor.

10.2.1.6 Termination of Kerb and Gutter
Where a kerb or kerb and gutter is terminated without joining a structure, the provision of a turnout “bull nose” of 125mm radius shall be formed on the upright end of the kerb.

10.2.1.7 Tolerances
The finished concrete shall not vary from the design horizontal alignment or vertical level by more than 10mm. The finished work shall not deviate from a 3m straight edge by more than 10mm. Deviations on vertical or horizontal curves shall not exceed 10mm from the true vertical or horizontal alignment.

10.2.2 Reinforced Dish Drains, Reinforced V-drains and Edge Restraints
10.2.2.1 Set Out and Forming
Reinforced dish drains, reinforced V-drains and edge restraints shall be set out to the line and level shown on the approved drawings, or where replacing existing elements to the same line and level as the existing, unless otherwise on the approved drawings, or as otherwise directed by Council’s Representative.

All elements shall be formed with formwork and hand placed concrete.

The shape of the required element shall be in accordance with Council’s Civil Works Specification – Standard Drawings.

10.2.2.2 Surface Finish
A finish equivalent to that achieved with a smooth steel trowel shall be achieved.

Water shall not be added to the surface of the concrete in order to achieve the required smooth finish. The Service Provider shall ensure that the concrete supplied is suitable to achieve the required finish without the addition of water to the surface.

All exposed corners are to be finished with a 10mm radius.

10.2.2.3 Joints
Full depth expansion joints shall be placed:
- At tangent points of curves of less than 25m radius.
- Where the concrete element abuts any other concrete elements or structures.
Shrinkage control joints are required at 3m maximum centres.

Joints in these elements when tied to a rigid pavement shall be in accordance with the requirements of the rigid pavement design. If no requirements are specified joint locations shall match those in the adjoining rigid pavement.

10.2.2.4 Tolerances
The finished concrete shall not vary from the design horizontal alignment or vertical level by more than 10mm. The finished work shall not deviate from a 3m straight edge by more than 10mm. Deviations on vertical or horizontal curves shall not exceed 10mm from the true vertical or horizontal alignment.

10.2.3 Unreinforced Concrete paths
All new concrete paths shall be reinforced in accordance with Section 10.2.4 below.

10.2.4 New Reinforced Concrete Paths
All new concrete paths shall be reinforced in accordance with this Specification. All new footpaths shall be a minimum of 1.5m in width unless specified to be another width by the conditions of Development Consent or separate Roads Act 1993 approval. When it is necessary for the footpath to be adjacent to the back of kerb or the footpath is adjacent to a school boundary, the minimum width shall be 1.5m.

All new shared paths shall adopt the width shown on the approved drawings. If dimensions are not shown then the shared path shall have a minimum width of 2.5m and be constructed in accordance with Council’s Civil Works Specification – Standard Drawings.

10.2.4.1 Set Out
Reinforced concrete paths shall be set out to the line and level shown on the approved drawings. Where not shown on the drawings, the edge of paths shall be parallel to the property boundary and 600mm from the property boundary, where the path is located between the road carriageway and the property boundary. The Service Provider shall seek clarification of path locations from Council’s Representative in all cases as some variations to the alignment may be necessary for reasons not obvious to the Service Provider.

10.2.4.2 Reinforcement
Reinforced concrete paths shall be 100mm thick and reinforced with SL72 mesh unless otherwise shown on the approved drawings.

10.2.4.3 Crossfall
Crossfall on all paths shall be between 1% and 2.5% sloping towards the kerb.
10.2.4.4 Surface Finish

Paths shall be initially steel float finished and then before initial set broom brushed to a non-skid texture. This shall be achieved by drawing a moistened nylon broom lightly across the surface at right angles to the path travel direction. A steel edging tool shall be used to provide a 10mm radius to smooth perimeter border to all edges and at all expansion joints.

Alternatively, paths may be cove finished with prior approval from Council’s Representative.

10.2.4.5 Joints

Joints shall be provided in paths in accordance with AS3727.1:2016 Pavements Part 1: Residential and as shown in Council’s Civil Works Specification – Standard Drawings and Section 10.1.3.8 Concrete Joints.

10.2.4.6 Tolerances

The finished concrete shall not vary from the design horizontal alignment or vertical level by more than 20mm. The finished work shall not deviate from a 3m straight edge by more than 10mm under a 3m straight edge longitudinally or transversely. Deviations on vertical or horizontal curves shall not exceed 20mm from the true vertical or horizontal alignment.

10.2.5 Vehicle Access Crossings

10.2.5.1 Set Out and Forming

Vehicle access crossing shall be located where shown on the approved drawings or as directed by Council’s Representative. Grades and levels of vehicle accesses shall be as indicated in Council’s Civil Works Specification – Standard Drawings.

The Service Provider must not alter vehicle access grades without approval from Council’s Representative.

When a proposed vehicle access crossing requires alteration of an existing concrete path, sufficient length of the concrete path shall be saw cut and removed to allow transition in vertical and horizontal alignment to accommodate the vehicle access crossing profile and maintain the path crossfall as shown in Council’s Civil Works Specification – Standard Drawings.

10.2.5.2 Gutter Crossing and Layback

Where a new gutter crossing and kerb layback are required the entire existing kerb and gutter shall be removed and reconstructed in accordance with Section 10.2.8 below.

10.2.5.3 Surface Finish

Vehicle access crossings initially steel float finished and then before initial set, broom brushed to a non-skid texture. This shall be achieved by drawing a moistened nylon broom lightly across the surface at right angles to the vehicle travel direction of the access crossing. A steel edging tool shall be used to provide a 10mm radius to smooth perimeter border to all edges and at all joints.
Alternatively, vehicle access crossings may be cove finished with prior approval from Council’s Representative.

In CBD public spaces, pavers may be used to compliment adjoining paved areas. Pavers used shall meet the requirements of AS/NZS4455.2:2010 Masonry units, pavers, flags and segmental retaining wall units Pavers and flags. Pavers shall be laid on sand or mortar bedding in accordance with the paver’s manufacturer’s specifications and over a concrete base as shown on the standard vehicle access crossing in Council’s Civil Works Specification – Standard Drawings.

10.2.5.4 Joints

Joints shall be provided in vehicle access crossings in accordance with AS3727.1:2016 Pavements Part 1: Residential and as shown in Council’s Civil Works Specification – Standard Drawings.

Expansion joints shall be placed at maximum 12m centres, at the property boundary and at the joint between the vehicle access and the kerb layback and where the vehicle access crossing abuts other concrete elements, structures or utility pits.

10.2.5.5 Tolerances

The finished concrete shall not vary from the design horizontal alignment or vertical level by more than 20mm. The finished work shall not deviate from a 3m straight edge by more than 10mm longitudinally or transversely. Deviations on vertical or horizontal curves shall not exceed 20mm from the true vertical or horizontal alignment.

10.2.6 Reinforced Open Concrete Drains – Sprayed or Hand Placed

10.2.6.1 Set Out and Forming

Open concrete drains shall be located where shown on the approved drawings or as directed by Council’s Representative. Grades, levels and cross sectional areas of open drains shall be as indicated on the approved drawings.

Open drains shall have a minimum thickness of 100mm unless otherwise shown on the approved drawings.

10.2.6.2 Surface Finish

Open drains which are hand placed and finished shall be steel floated to a smooth finish. A steel edging tool shall be used to provide a 10mm radius to smooth to all edges corners.

Sprayed concrete shall have a consistent dense surface finish with no irregularities, bumps or depressions.

10.2.6.3 Joints

Unless otherwise shown on the drawings, expansion joints shall be placed at maximum four (4) metre centres and where open channels abut other concrete elements or structures.

Shrinkage control joints are not required unless otherwise shown on the approved drawings.
10.2.6.4 Tolerances

Deviations on vertical or horizontal curves shall not exceed 40mm from the true vertical or horizontal alignment. There shall be no isolated depressions in the surface finish that will pond water. Continual fall in the invert of the channel is required. The cross section of the resultant channel shall not be smaller than that specified on the approved drawings.

10.2.7 Provisions for Existing or Proposed Utilities and Service Mains

Where a proposed vehicle access crossing, path or other concrete element is to be constructed before the planned installation of service mains and utilities, conduits or sections of mains shall be first installed under the concrete element in accordance with requirements of the relevant authorities.

Where a proposed vehicle access crossing or other concrete element is to be constructed over existing service mains or utilities, provision shall be made for access to valves, water service stop cocks or similar. If the depth to existing mains or utility is being reduced the relevant authority shall be contacted by the Service Provider to obtain that Authorities requirement and approval.

Regardless of whether cover is being reduced, increased or remaining the same, where a vehicle access crossing or other concrete element is to be constructed over an asbestos cement water main, the Water Authority shall be contacted prior to any works, to determine the exact location of the main and to determine if that section of main requires replacement.

For further details about road openings and restorations see Section 7 - Utility Services Installation, Road Opening and Utility Restorations.

10.2.8 Construction and Replacement of Kerb and Gutter, Dish Drains and V-drains along the Edge of Existing Pavement Areas

The existing pavement shall be saw cut a minimum 300mm out from and parallel to the new concrete element.

Remove the existing pavement to a depth of 150mm below the base of the proposed concrete element and extend 150mm beyond the footprint of the proposed element.

150mm of subbase quality material shall be placed and compacted to the requirements of Section 8 - Flexible Pavement Construction of this Specification. A minimum of two (2) relative density tests shall be required on the new subbase unless otherwise advised by Council’s Representative.

The new concrete element shall then be constructed in accordance with this Specification.

The area between the saw cut in the pavement and the concrete element shall be filled with compacted deep lift asphaltic concrete in accordance with this Specification.

This section is applicable to vehicle access construction where a new gutter crossing with layback is required.
10.3 Compliance Inspections, Testing and Documentation Requirements

Compliance with this Specification shall be demonstrated during inspections by Council’s Representative, testing as required by Section 5 - Site Clearing and Bulk Earthworks and Section 8 - Flexible Pavement Construction of this Specification where applicable, relative compaction testing on bedding subbase layers, provision of material quality tests from the supplier when requested and provision of copies of delivery receipts confirming the material type supplied when requested.

Testing of concrete supplied other than that required by concrete batching plants for conformance with Australian Standards, should not be required; however, Council’s Representative may request sampling and testing for determination of concrete strength or other nominated properties in the case where there is doubt about the strength grade or properties of the concrete being provided or where the Service Provider proposes to open the concrete element to traffic prior to concrete reaching its full twenty-eight (28) days strength.

Level tolerance and horizontal alignment of elements shall be demonstrated by work-as-executed surveys and drawings prepared by a Registered Land Surveyor. The requirement to provide work-as-executed drawings on small infill kerb and gutter works or single vehicle access construction may be relaxed by Council’s Representative in cases where levels are dictated by existing site features.

10.3.1 Non-complying Work

Where works are observed by Council’s Representative to not comply with this Specification the Service Provider shall be instructed verbally or in writing of the non-compliance. The non-complying works(s) shall be rectified or removed before the works proceed further.

Where test results for relative compaction show non-compliance, the material shall be reworked and re-compacted. Retesting shall be required to demonstrate compliance.

Where material quality test results demonstrate non-compliance with this Specification, that material shall be removed and replaced with complying material.
Section 11 - Major Concrete Works

11.1 General

The works covered by this section of the Specification comprise the construction of major concrete elements, products and structures including:

- Buildings and building elements.
- Bridges.
- Large cast in situ drainage structures including box culverts, open channels and non-standard pits.
- Retaining walls.

All structures covered by this section of the Specification are required to have had a design and a specification for the construction of the structure prepared by a Certified Practising Civil or Structural Engineer. All concrete structures shall be designed and constructed in accordance with AS3600 – Concrete structures.

The specification for the construction of the structure prepared by the Certified Practising Civil or Structural Engineer will take precedence over any conflicting requirement of this Specification.

11.2 Certification of the Design and Construction

Certification of the design stating compliance with relevant Australian Standards will be required prior to construction. Inspections and certification of the construction confirming compliance with the design specifications shall be required as construction progresses. Certification at the completion of the structure shall be required to confirm that the structure has been constructed in accordance with the design and specification, is structurally adequate and shall meet the serviceability requirements intended by the design.

These certifications shall be provided by a suitably qualified Structural and Geotechnical Engineer(s). Copies of all certifications shall be provided to Council’s Representative.

11.3 Construction and Material Requirements

11.3.1 General

All works shall comply with the requirements of Section 17 - Material and Construction Requirements of AS3600 – Concrete structures. The following additional specific requirements shall apply where not specified in the specification for the construction of the structure as prepared by the Certified Practising Civil or Structural Engineer.

The requirements of AS3600 shall take precedence over the following requirements. Any conflicts between AS3600 Section 17 and the specification for the construction of the structure prepared by a Certified Practising Civil or Structural Engineer shall be brought to the attention of Council’s Representative.
11.3.2 Formwork and False Work

11.3.2.1 General Requirements
Formwork and false work shall comply with the relevant requirements of AS3610 – Formwork for concrete.

Certification that formwork and false work are structurally sound and suitable for the purpose they have been constructed shall be required from a Certified Practising Civil/Structural Engineer prior to the placement of any concrete.

Formwork shall be provided to produce hardened concrete to the lines, levels and shapes shown on the approved drawings or as specified by Council’s Representative. Formwork shall have adequate strength to carry all applied loads, including the pressure of fresh concrete, vibration loads, weight of workers and equipment, without loss of shape. Forms shall be mortar tight and designed to allow removal without risk of damage to the completed structure. Joints in the formwork shall be perpendicular to the main axis of the shape of the concrete.

Subject to approval by the design and Certifying Engineer, false work may be supported on completed sections of the works provided that the construction loads imposed thereon do not result in over-stressing or instability and that due allowance is made for any deflection of the supporting sections.

The Service Provider on the advice of the Certified Practising Civil/Structural Engineer shall undertake structural strengthening or modification of such sections necessary for their use as support structures.

11.3.2.2 Concreting Against Rock and Firm Ground
Concrete may be placed against rock faces, provided that the cover to the reinforcement on the rock face is increased by a minimum of 25mm. Before any concrete is placed against a rock face all leakage and percolation of water which could cause damage to the wet concrete shall be effectively sealed. Concrete shall not be poured against horizontal or inclined rubble, fill or earth surfaces in lieu of formwork.

11.3.2.3 Formed Surface Finish
Finishes to formed surfaces shall be produced in accordance with the requirements and recommendations of AS3610 – Formwork for concrete and the specification for the structure. If the surface class is not specified, the class listed in Table 11.1 below shall be used.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footings and other buried structures, rear surfaces of retaining walls, surfaces to be faced with stone</td>
<td>Class 5</td>
</tr>
<tr>
<td>Bridge and other surfaces which shall receive heavy applied finishes</td>
<td>Class 4</td>
</tr>
<tr>
<td>Surface</td>
<td>Class</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Concealed surfaces of walls, beams, slab soffits, stairs, abutments,</td>
<td>Class 3</td>
</tr>
<tr>
<td>bridge decks, etc</td>
<td></td>
</tr>
<tr>
<td>Surfaces to receive a granular or plaster finish, and all exposed</td>
<td>Class 2</td>
</tr>
<tr>
<td>surfaces</td>
<td></td>
</tr>
<tr>
<td>Surfaces not specified</td>
<td>Class 2</td>
</tr>
</tbody>
</table>

11.3.3 Reinforcement

11.3.3.1 General Requirements

Steel reinforcement supplied to the site and incorporated into the works shall conform to

\textit{AS/NZS4671:2001 – Steel reinforcing materials} and \textit{AS3600 – Concrete structures}.

All steel shall be free from loose or thick rust, loose mill scale, grease, tar, paint, oil, dirt, mortar or other unspecified coating. If the steel has more than a thin film of rust it may be rejected for use in the works, and shall be immediately removed from the site by the Service Provider. Reinforcement shall be stored and supported above ground and protected from contaminants.

Reinforcement shall be readily identifiable as to grade, origin and its final location in the works. The necessary tie wire, support chairs, spacers, supplementary reinforcement and the like shall be supplied for adequate fixing of the reinforcement.

The Service Provider shall provide a certificate of compliance with the relevant standard \textit{AS/NZS4671:2001 – Steel reinforcing materials}, or alternatively provide test certificates from a NATA registered testing authority. Test certificates shall show results of mechanical tests and chemical analysis.

Where the material cannot be identified with a test certificate, samples shall be taken and testing arranged by the Service Provider. The samples shall be selected randomly and consist of three specimens each at least 1.2m in length.

The cost of all samples and tests shall be borne by the Service Provider.

11.3.3.2 Splicing

All reinforcement shall be furnished in the lengths indicated on the approved drawings. If splicing is required, it shall be in accordance with the provisions of \textit{AS3600 – Concrete structures}. All splices shall be at the locations shown in the approved drawings or described in the specification for the structure.

11.3.3.3 Fabric Splices

A lap splice for fabric shall be made so that the two (2) outermost transverse wires of one (1) sheet of fabric overlap the two (2) outermost transverse wires of the sheet being lapped plus 25mm.
11.3.3.4 Weld Splices
Bars may only be welded by an approved electrical method as directed by Council’s Representative. No welding will be allowed on cold-worked or hard grade reinforcing bars.

Welding shall conform to the requirements of AS/NZS1554.3:2014 – Structural steel welding - Welding of reinforcing steel and shall be carried out in the presence of Council’s Representative.

Unless otherwise approved by Council’s Representative, the welded splice shall meet requirements of tensile and bend tests specified for the parent metal.

11.3.3.5 Storage
Reinforcement, unless concreted promptly, shall be stored under a waterproof shelter and supported above the surface of the ground, and shall be protected from injury and from deterioration due to environmental exposure.

11.3.3.6 Bending
Reinforcement shall be carefully formed to the dimensions and shapes shown on the approved drawings. Reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the approved drawings shall not be permitted.

11.3.3.7 Protective Coated Reinforcement
Unless otherwise shown on the approved drawings, if an element is specified to contain protective coated reinforcement, the same coating type shall be provided to all of that element’s reinforcement and embedded ferrous metal items, including tie wires, stools, spacers, stirrups, plates, ferrules and the like.

Galvanised reinforcement shall comply with AS4680:2006 – Hot-dip galvanized (zinc) coatings on fabricated ferrous articles, and the following requirements.

Minimum coating mass:

- For wire: Type A.
- For reinforcement: 100 microns of 98% pure zinc metal.
- Preparation: Pickling to AS1627.5:2003 – Metal finishing - Preparation and pre-treatment of surfaces - Pickling.
- Passivation: After galvanising, the galvanized coating shall be passivated by immersion in a bath of 0.2% sodium dichromate solution.

If damage occurs to the coating, either the damaged reinforcement shall be replaced, or repairs may be carried out to AS4680:2006 – Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.
Starter bars and the like left projecting from cast concrete for future additions, otherwise unprotected and expected to be exposed to the weather for more than one (1) month, shall be coated with a cement wash.

11.3.3.8 Placing and Fixing Reinforcement

Reinforcement shall be spaced accurately to the pitches and position as shown on the approved drawing. Reinforcement shall be secured against displacement by tying at all intersections with annealed iron wire ties not smaller than 1.25mm diameter, or by approved clips. The ends of wire ties shall be bent away from nearby faces of forms so that the ties do not project into the concrete cover.

Bars forming a lapped splice shall be securely wired together in at least two places, unless welded and shall comply with AS3600:2009 – Concrete structures.

11.3.3.9 Reinforcement Supports

Reinforcement shall be supported by purpose-made plastic chairs. Steel shall not be supported on metal supports which extend to the surface of the concrete, on wooden supports, or on pieces of coarse aggregate or loose rock.

For exposure classifications more severe than A1, as defined in AS3600:2009 – Concrete structures, reinforcement shall be accurately supported by plastic supports of adequate strength and of a shape appropriate to the location.

Damage to waterproofing membranes or vapour barriers shall be prevented by placing a plastic plate under each support to prevent puncturing when reinforcement is supported over membranes.

Chairs shall be spaced sufficiently close together to ensure that the specified cover is maintained during placement of concrete, and to ensure that crushing of the chairs or penetration into the formwork does not occur. The reinforcement shall not have permanent deflection or displacement of more than 2mm during placing and consolidation of the concrete.

11.3.4 Placing and Compaction of Concrete

11.3.4.1 General Requirements

The Service Provider shall plan and control the placing, compacting, curing and finishing operations to prevent cracking in the various concrete elements.

No concrete shall be placed in the works until the false work, formwork, reinforcement and stressing materials have been inspected, all foreign material has been completely removed from the forms and certification has been given by the Civil/Structural Engineer responsible for inspecting and certifying the formwork and false work.

Formwork shall not be disturbed or adjusted during the concreting operation, and shall remain undisturbed up to the minimum removal time specified.
11.3.4.2 Placing

Concrete shall be deposited within the forms as near as possible to its final location.

Excessive use of vibrators and tamping rods to move the concrete along the forms is not permitted.

Movement of concrete to the pour face may be by means of suitable conveyors, clean chutes, troughs or pipes which shall be made of metal, or have metal linings, or by pumping.

Water shall not be used to facilitate the movement.

Unless adequate protection is provided, concrete shall not be placed during rain or when rain appears imminent.

Prior to placing concrete, the area shall be clean and moist, but free from any water ponds.

No concrete shall be placed if:

- The temperature of the concrete is less than 10°C or exceeds 35°C.
- The ambient air temperature is likely to be greater than 35°C during placement or within 2 hours subsequent to placement.
- The ambient air temperature measured at the point of placement is likely to exceed 35°C during placing and finishing operations, the Service Provider shall take practical precautions to ensure that the temperature of the concrete does not exceed the permitted maximum so that the concrete can be placed and finished without defects.

Special attention shall be paid to providing early curing for hot weather concreting operations. The Service Provider is to provide a proposal for the protection of concrete in cold or hot weather.

Concreting operations shall be carried out in a continuous manner between approved construction joints or from end to end in the case of precast items. Fresh concrete shall not be placed against concrete which has taken its initial set. If an interruption (around 45 minutes) occurs that causes the initial set at the leading edge of the concrete, a construction joint approved by the Civil/Structural Engineer responsible for the design shall be placed.

The concrete shall be deposited in the forms, without separation of the aggregates. Concrete shall not be dropped freely from a height greater than 1.2m, or be deposited in large quantities at any point and moved or worked along the forms. Buckets shall have the capability of a controlled rate of discharge. If placing operations necessitate a drop of more than 1.6m, the concrete shall be placed using a flexible tube reaching to the base of the formwork.

Concrete shall be deposited in horizontal layers not exceeding 600mm in thickness and compacted such that each succeeding layer is blended into the preceding one by the compaction process.

Concrete shall not be moved after it has been in the forms for more than 10 minutes.
The Service Provider shall keep on site and make available for inspection a log book recording each placement of concrete including:

- Date.
- The portion of work.
- Specified grade and source of concrete.
- Slump measurements.
- Volume placed.

Concrete affected by rain before it has set, including during mixing, transport or placing, shall be deemed as non-compliant.

### 11.3.4.3 Compaction

Concrete shall be compacted immediately after placing by immersion and/or screed vibrators accompanied by hand methods, continuous spading or slicing as appropriate to remove entrapped air and compact the mix. At least one (1) reserve vibrator, in working order, shall be provided as standby during concreting operations.

Form vibrators shall be used where use of immersed vibrators is impracticable. Concrete shall be fully compacted and entrapped air removed, but the concrete shall not be over vibrated such that segregation is caused. Vibrators shall not come into contact with partially hardened concrete, or reinforcement embedded in it. Vibrators shall not be allowed to rest on reinforcement or be used to move concrete along the forms.

Exposed surfaces of the concrete shall be struck off and finished with a wooden float. Where shown on the approved drawings corners and edges shall be left neatly rounded or chamfered. Re-entrant angles shall be neatly filleted.

### 11.3.5 Curing and Protection

#### 11.3.5.1 General

All finishing operations shall be completed prior to the application of any curing. The finishing operations shall be such as to provide a dense surface free from visible surface cracking.

For all types of curing regimes, the concrete surface shall be maintained at a temperature not less than 5ºC throughout the curing period.

All exposed surfaces shall be cured using a commercial curing compound in accordance with AS3799:1998 – *Liquid membrane - forming curing compounds for concrete*, for a minimum period as detailed in the specification for the structure. During this time the work must be adequately protected from the effects of excessive surface evaporation, rain, running water, vandalism, any traffic and other causes likely to damage the concrete. All costs involved in making good or replacing any work that has been damaged due to the above mentioned factors shall be the Service Provider's responsibility.
Wax-based or chlorinated rubber-based curing compounds shall not be used on surfaces forming substrates to concrete toppings, bridge decks, cement-based render and the like.

11.3.5.2 Protection
The Service Provider shall obtain the approval of the Inspecting/Certifying/Design Engineer before loading the concrete structure. The concrete shall be protected from damage due to load overstressing, heavy shocks and excessive vibrations, particularly during the curing period.

Finished concrete surfaces shall be protected from damage from any cause, including mortar splashes and stains, timber stains, rust stains, chemical attack, additives, curing compounds, protective coatings, rain, running water and the like.

11.3.6 Project Assessment of Concrete
The specification for the structure prepared by the Practising Civil or Structural Engineer shall specify the requirements for project assessment including details of how the assessment shall be made if different from AS1379:1998 – Liquid membrane-forming curing compounds for concrete.

In the case that no Project Assessment of the concrete is specified the Service Provider shall confirm with the Certified Practising Civil or Structural Engineer who prepared the specification that no Project Assessment is required.

11.4 Compliance

11.4.1 Compliance Inspections, Testing and Documentation Requirements
Inspections and certification of the construction confirming compliance with the design and specifications will be required as construction progresses and will be required to be carried out by the Certified Practising Civil or Structural Engineer who prepared the design or their appointed representative. Certification will be required at the completion of the structure to confirm that the structure has been constructed in accordance with the design and specification, is structurally adequate and will meet the serviceability requirements intended by the design. Copies of all certificates shall be provided to Council’s Representative.

The results of all project assessment testing shall be supplied to Council’s Representative. The results of testing carried out by the Service Provider’s concrete supplier confirming compliance with AS1379:1998 – Liquid membrane-forming curing compounds for concrete shall be supplied to Council’s Representative.

Certification that the reinforcing steel supplied for the structure complies with AS/NZS4671:2001 – Steel reinforcing materials shall be provided to Council’s Representative.

Council’s Representative may also carry out inspections of the construction of the structure for compliance with the design, the design specification and this Specification where applicable. Any non-compliance observed shall be brought to the attention of the Service Provider and the Certified Practising Civil or Structural Engineer or their appointed representative responsible for providing construction and completion certification of the structure as required by this section of the Specification.
11.4.2 Non-complying Work

Where works are observed, by the Practising Civil or Structural Engineer or their appointed representative responsible for providing construction and completion certification or Council's Representative, to not comply with the specification for the structure, this Specification or AS3600:2009 – Concrete structures, the Service Provider shall be instructed verbally or in writing of the non-compliance. The non-complying item(s) shall be rectified before the works proceed further.

Where test results from concrete suppliers and/or the project assessment show a non-compliance, remedial action shall be taken by the Service Provider following the advice of the Certified Practising Civil or Structural Engineer responsible for the design.

Where other material quality test results demonstrate a non-compliance with the specification for the structure, this Specification or AS3600:2009 – Concrete structures, remedial action shall be taken by the Service Provider following the advice of the Certified Practising Civil or Structural Engineer responsible for the design.

Failure by the Service Provider to rectify any non-complying work to the satisfaction of the Practising Civil or Structural Engineer or their appointed representative responsible for providing construction and completion certification and Council's Representative shall result in the works not being issued with a Compliance Certificate.
Section 12 - Bituminous Sealing

12.1 General

This section specifies:

- The type of bituminous seal required in specific situations.
- The requirements for supplying and constructing primers, primer sealing and sealing where required in accordance with this Specification.

12.1.1 General Requirements


All bitumen emulsion primer seals or seals shall be provided in accordance with the latest *Austroads Guidelines* and the recommendations of the bitumen emulsion manufacturer and/or supplier.

Unless otherwise shown in the Council accepted pavement design, or on the approved drawings, bituminous seals will be required as defined below:

- 10mm seal is required on the surface of base course pavement layers, under all asphalt surfacing layers.
- 7mm and 14mm two (2) coat or seal on roads classed by Council as rural.
- 10mm single coat seal is required on all road shoulders nominated to be sealed and on “All Weather Surfaces”.

Other sealing types may be required where shown on the Council accepted pavement design.

Generally, class 170 (to *AS2008:2013 Bitumen for pavements*) hot bitumen is to be used as the binder for sprayed sealing works with the addition of cutting oil as required depending on site conditions.

Cutback hot bitumen class shall be within the appropriate class for the primer (AMC00 to AMC1), primer binder (AMC2 to AMC4) or seal (AMC5 to AMC7) in accordance with *AS2157:1997 – Cutback bitumen*.

Cationic rapid setting Bitumen Emulsion may be used as the primer seal binder.

Sealing shall only be carried out following suitable preparation of the road base surface which is to be sealed. The surface to be sealed must comply with the requirements of Section 8 - Flexible Pavement Construction of this Specification and shall be:

- Homogeneous in nature without segregation of similar size particles.
• Uniform in texture to achieve a uniform bond.
• Hard and dense to resist embedment of sealing stone.
• Capable of being broomed without laminating or tearing of the surface.
• Free from loose material or foreign matter.

All surfaces to be sealed shall be inspected by Council’s Representative prior to commencement of sealing operations.

The type of binder used in sealing shall be selected by the Service Provider with due consideration to required curing times before placement of traffic on the seal or placement of asphalt surfacing over the seal or primer seals.

Completed and cured seals must be observed to be consistently and securely adhered to the underlying pavement layer. Seals that strip or detach from the underlying material in mat-like fashion under traffic or with minimal force applied will be rejected.

12.1.2 Clarifications in Relation to National Sprayed Sealing Specification 1st Edition 2004

Where “Superintendent” is stated this shall mean Council’s Representative.

References to measurement and payment do not form part of this Specification.

In Clause 3.1 the type of sprayed seal treatment shall be as specified Section 12.1.1 above.

In Clause 7 warning signs indicating the absence of line marking shall be erected and maintained by the Service Provider.

If required by the Service Provider, the schedule of job details shall be completed by the Service Provider using information contained in this Specification and the Council accepted pavement design and then provided to the sealing Sub-contractor.

In Part D6 the class of binder for primer seals shall be determined by the Service Provider based on experience and the notes provided in Part B of the National Sprayed Sealing Specification. The Service Provider shall consult with Council’s Representative when selecting the class of binder.

In addition to Clause D7.6 traffic control shall be in accordance with Section 4 - Traffic Management of this Specification.

In addition to clause C5 the Service Provider shall keep records of when loose stone was removed and when warning signs were removed.

12.1.3 Bitumen Emulsion Seals

Cationic rapid setting (CRS) Bitumen Emulsion may be used as the binder. Bitumen emulsions shall comply with AS1160:1996 – Bituminous emulsions for the construction and maintenance of pavements. CRS bitumen seals shall be constructed in accordance with the latest Austroads Guidelines at a rate of approximately 1.3 to 1.5 litres/m². The 10mm aggregate shall be applied at a
rate of approximately 120 to 140m²/m³, for minor works only with prior approval from Council's Representative.

12.2 Compliance

12.2.1 Compliance Inspections, Testing and Documentation Requirements

The following inspections will be required to be carried out by Council's Representative:

- Prior to surface preparation by the sealing Service Provider.
- Following surface preparation by the sealing Service Provider.
- Prior to spraying of binder.
- During spraying of binder and placement of aggregate.
- Following completion of the seal.

The Service Provider shall provide a copy of their quality plan, test certificates, design calculations (if applicable) and records relating to sealing works if requested by Council's Representative.

12.2.2 Non-complying Work

Where works are observed by Council's Representative to not comply with this Specification the Service Provider will be instructed verbally or in writing of the non-compliance. The non-complying item(s) will be required to be rectified before the works proceed further.

Where material quality test results demonstrate a non-compliance with this Specification that material shall be removed and replaced with complying material.

Where a seal fails to perform as a result of material quality, a poor design, or an error on the part of the Service Provider then the Service Provider shall propose a method of rectification for the acceptance of Council's Representative. Compliance Certificates will not be provided until all rectification works are complete.
Section 13 - Asphalt Surfacing

13.1 General

This section covers the requirements for the following:

- Design of asphalt mixes.
- Requirements of constituent materials in asphalt mixes.
- Preparation for placement of asphalt.
- Placement and compaction of asphalt.
- Compliance inspections, testing and documentation to demonstrate compliance.

The types of asphalt covered by this Specification are:

- Dense Graded Asphalt (DGA or AC).
- Fine Gap Graded Asphalt (FGGA).

13.1.1 General Requirements

For the purpose of this section of the Specification asphalt shall be split into two categories:

- **Category 1**
  Pavements with a design traffic loading greater than or equal to $1 \times 10^7$ Equivalent Standard Axle (ESA) Loads.

- **Category 2**
  Pavement with a design traffic loading up to $1 \times 10^7$ Equivalent Standard Axle (ESA) Loads.

Asphalt surfacing will be required in all new urban residential, industrial and commercial development roads regardless of the pavement being full road, half road or shoulder construction.

Asphalt surfacing will also be required in rural cul-de-sac/turning circles and rural intersections unless otherwise indicated on the approved drawings.

The Service Provider supplying the asphalt shall have established, implemented and maintain a Quality System in accordance with this Specification and the requirements of AS/NZS ISO9001:2015 – Quality management systems - Requirements.

This requirement does not apply to a Service Provider placing a small area of asphalt up to $120m^2$ associated with pavement shoulder or kerb and gutter construction.

13.1.2 Asphalt Surfacing Type and Thickness

Asphalt surfacing shall be supplied and placed using the following types and thickness of asphalt unless otherwise specified in the approved pavement design report.
Urban Residential Developments with design ESA up to $3 \times 10^5$ shall have a minimum 30mm thick AC10 on a 10mm seal in accordance with Section 12 - Bituminous Sealing.

Urban Residential Developments with design ESA up to $3 \times 10^5$ to $1 \times 10^7$ shall have a minimum 40mm thick AC10 on a 10mm seal in accordance with Section 12 - Bituminous Sealing.

Rural Intersections and cul-de-sacs/turning circles shall have a minimum 40mm thick AC10 on a 10mm seal in accordance with Section 12 - Bituminous Sealing.

Industrial/commercial developments shall have an asphalt surfacing thickness in accordance with the approved pavement design report. The thickness will be specified following consideration of the heavy vehicle loadings and likely vehicle turning and braking forces.

Surfacing other than dense graded asphalt shall only be used where specified in the approved pavement design report.

The asphalt surfacing shall not be laid within seven (7) days of the placing of a seal. This requirement shall only be changed with the approval of Council’s Representative following consideration of information presented by the Service Provider justifying an earlier placement of asphalt. In any case the Service Provider shall obtain their own advice as to the appropriate length of time that a seal should be allowed to cure prior to the placement of asphalt over the seal. That advice shall take into consideration the amount of cutter present in the bitumen binder of the seal.

Asphalt that is adversely affected due to being placed over a seal that has not been allowed to fully cure shall be fully removed along with the underlying seal and replaced.

Seals that have been affected by the trafficking of vehicles over the seal shall be resealed to the satisfaction of Council’s Representative prior to placement of asphalt.

13.1.3 Asphalt Mix Design
Asphalt mix designs shall be carried out by the Service Provider or their asphalt suppliers in accordance with the specifications nominated in this section. Any documentation relating to mix designs shall be provided to Council’s Representative upon request.

13.2 Supply and Placement of Asphalt

13.2.1 Asphalt for Traffic Loading
Asphalt for pavements shall be supplied, placed, finished and tested in accordance with the requirements of the Roads and Maritime Services Specification *R116 Heavy duty dense graded asphalt*. The following clarifications in relation to the requirements of *R116* shall apply:

13.2.1.1 Generally
- “Superintendent” or “Principal” shall mean “Council’s Representative”.
- A “Project Quality Plan” is not required.
• Documentation required in Annexure R116/D shall be provided when requested by Council’s Representative.
• Referenced documentation shall be those that are current at the date of the pre-construction site meeting.
• Hold points shall not be applicable unless requested by Council’s Representative.

13.2.1.2 Supply of Asphalt
• If not specified in the approved pavement design report, binder shall be class 320 bitumen.
• Submission of mix designs to Council’s Representative is not required unless requested by Council’s Representative.

13.2.1.3 Placing Asphalt
• Course layer thicknesses shall be as nominated in this section of the Specification or as nominated in the approved pavement design report.
• Nomination of the minimum temperatures and measurement of temperatures will not be required unless requested.
• Nomination of tack coat application rates will not be required unless requested.
• A placement trial will not be required.

13.2.1.4 Finished Pavement Properties
• Compaction control testing on cores is not required unless requested by Council’s Representative.
• When compaction testing is requested a lot shall be the section of pavement nominated for testing. A minimum of three cores will be required in any section of pavement requiring testing for compaction.
• For the purpose of determining course thickness compliance a lot shall be a section of pavement up to 100m length.
• Cores for determining course thickness compliance shall be taken when requested by Council’s Representative. A minimum of three cores will be required in any section of pavement requiring testing for course thickness.
• The surface shape requirements shall apply to all road pavements. Surface shape requirements shall be tested by Council’s Representative.
• Determination of riding quality in accordance with R116 Section 4.5 Ride Quality will only be required when requested by Council’s Representative.

13.2.1.5 Conformity
• Areas that exhibit cracking, ravelling, bony or fatty material, or have been damaged during construction in the opinion of Council’s Representative, shall be
removed and replaced. The extent of the removal and replacement will be
directed by Council’s Representative.

- Sampling and testing of the asphalt mix or placed asphalt shall only be required if
  requested by Council’s Representative.
- Results of any tests requested by Council’s Representative shall be provided to
  Council’s Representative prior to the pre-final inspection.
- The Service Provider shall rectify any area of non-conforming asphalt works as
determined by Council’s Representative following consideration of finished
pavement properties and test results.
- Any reference to “schedule of rates” and deductions do not form part of this
Specification.

13.2.2 Other Requirements for Asphalt Supply and Placement

Where procedures for the supply and placement of asphalt are not covered in Roads and Maritime
Services R116 Heavy duty dense graded asphalt, the procedures of AS2150 – Hot Mix Asphalt
and Austroads Guide to Pavement Technology – Part 4B shall be adopted.

Asphalt placed against the lip of gutter shall not be lower than the lip level or 10mm higher than
the lip level. The criteria shall be applied during the pre-final inspections and at the end of the
defects liability period. This requirement shall be applied regardless of the requirements of other
specifications and standards referred to in this section.

13.3 Compliance

13.3.1 Compliance Inspections, Testing and Documentation Requirements

The following inspections and tests will be required to be carried out by Council’s Representative:

- Prior to placement of Asphalt – inspection of seal and preparation.
- During placement of Asphalt.
- Following completion of asphalt surfacing.
- Surface shape using a 3m straight edge.
- Pre-final inspection.

The Service Provider shall provide a copy of test certificates, design calculations and records
relating to asphalt works if requested by Council’s Representative.

The Service Provider shall arrange and meet the cost of testing requested by Council’s
Representative.
13.3.2 Non-complying Work

Where works are observed by Council’s Representative to not comply with the Specification requirements the Service Provider will be instructed verbally or in writing of the non-compliance. The non-complying item(s) will be required to be rectified before the works proceed further.

Where material quality test results demonstrate a non-compliance with this Specification, that material shall be removed and replaced with complying material.

Where asphalt surfacing fails to perform as a result of material quality, poor design, or an error on the part of the Service Provider, the Service Provider shall propose a method of rectification for the acceptance of Council’s Representative. Compliance Certificates will not be provided until all rectification works are complete.

In the case of asphalt being low at the lip of kerb and gutter or flush kerb, the asphalt shall be removed and replaced from the lip alignment to the crown alignment of the road or other alignment as agreed to by Council’s Representative. Should removal of the asphalt result in the removal of the primer seal below the asphalt then the primer seal shall be reinstated prior to any asphalt being placed.
Section 14 - Cold Milling of Asphalt and Base Course

14.1 General

This section covers the requirements for the removal of pavement materials from road pavements by cold milling, including the treatment of the milled vertical surfaces and the cleaning up, removal and disposal of the milled materials.

For traffic safety reasons, the Service Provider shall ensure that all milling or profiling work is not carried out any sooner than 48 hours prior to new asphalt being placed on the milled surface.

All traffic control will be undertaken in accordance with Section 4 - Traffic Management of this Specification.

14.2 Detection and Documentation of Hidden Object

The Service Provider shall undertake a comprehensive investigation to determine the location of all hidden objects within the limits of work. This shall include, but is not limited to the following:

- Make enquiries with the relevant Authorities to confirm the exact locations of all objects within the proposed milling area.
- Survey the area to be milled for Hidden Objects using a locating device or metal detector. The locations and extent of any objects (metal objects, public utilities, etc) detected must be clearly marked on site. Determine whether the Hidden Object is within the depth to be milled.
- Submit a report, 5 working days before commencing works, with the following information:
  - Survey details of any hidden objects or utilities.
  - Written advice confirming that all authorities’ requirements have been satisfied.

Protection of underground utilities shall be in accordance with this Specification Section 7 - Utility Services Installation, Road Opening and Utility Restorations.

14.3 Cold Milling Operation

Set out the cold milling work area as shown on the drawings or as specified by Council’s Representative. Mark all milling depths and locations of any hidden objects or utilities on the road surface.

Perform cold milling to the nominated depth(s), width, length, alignment and road sections as per drawings or as directed by Council’s Representative.
Demonstrate the use of controls to the satisfaction of the Council’s Representative. Control the cold milling machine either by levelling beam or stringline and automatic sensors unless otherwise approved.

There shall be a 5mm maximum difference in levels between adjacent runs, depths and surface levels.

If milling near access chambers or other similar structures, operate the cold milling machine as close as possible to the structure without causing damage to it. Remove the remaining asphalt and base course by hand or other approved method.

14.3.1 Milling to Achieve Specified Depth of Cut
Milling to achieve a specified depth of cut may be directed in one of the following ways:

- Where nil tolerance on depth of cut applies for ‘greater than specified’ refer to Figure 14.1 below.
- Where above and below depth of cut has been specified refer to Figure 14.2 below.

14.3.2 Milling to Retexture a Surface
Groove depths in the existing surface to be between 5 – 10mm depth. Do not fully remove the existing surface. Groove spacing to be 10mm maximum.

14.3.3 Milling to Optimise Final Ride Quality
When the Service Provider is milling to optimise final ride quality, the outcome shall be achieved by cutting to an average depth predetermined by survey and to tolerance as specified in Table 14.1 below. The nominal cutting width must be 2m.

The milling machine must be equipped and operated using a minimum 6m averaging beam or an equivalent non-contact system. The Service Provider must set the milling operations to a constant speed and the cutting sequence must start from the crown and proceed towards the kerb.

The Service Provider shall verify the shape and profile of the milled surface by the use of a 3m straight edge after each cut. The milled surface must not deviate from any point on the bottom of the straight edge by more than 5mm.

14.3.4 Cold Milling over Concrete Structures
Where cold milling is required over existing concrete structures the Service Providers shall undertake a comprehensive investigation to determine the thickness of the existing asphalt over each Concrete Structure.

Carry out the investigation as follows:

- Determine the proposed pattern of milling works and mark on the pavement the lines of movement of the depth sensing foot on each side of the milling machine.
• Investigate the thickness of asphalt by taking small diameter cores (e.g. 25mm), at 3m intervals (over concrete bridge elements) or 20m intervals (over other concrete structures) along each line of movement of a depth sensing foot, at least 24 hours prior to the commencement of milling.

Submit the findings of the investigation to Council’s Representative at least 24 hours before commencement of milling.

The depth of cut shall conform to the requirements of Table 14.1 below.

### 14.3.5 Temporary Ramps

Where the milled surface is to be temporally opened to traffic the edges of the milled surface shall be tied into the existing road surface.

There are two methods allowed for forming temporary ramps, these are, bevelling and the placement of cold mix asphalt.

When bevelling with the cold milling machine ensuring any lip remaining at the toe or head of the bevel does not exceed 10mm in height. Ensure surface and horizontal tolerance conform to Table 14.2 below.

The use of cold mix asphalt shall conform to the following:

- Apply an emulsion tack coat to the milled surface prior to the placement of cold mix asphalt.
- Maximum thickness and layering of cold mix asphalt shall conform to Table 14.2 below.
- Leave the cold mix asphalt ramp in place no longer than one week.
- Maintain the ramp in good condition.
- Compact all cold mix.
14.3.6 Tolerances

Table 14.1 Tolerances for Cold Milling Operations

<table>
<thead>
<tr>
<th>Nature of Milling Work</th>
<th>Tolerance, Depth of Cut (mm)</th>
<th>Groove Spacing (mm)</th>
<th>Surface Texture Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Greater than specified</td>
<td>Less than specified</td>
<td></td>
</tr>
<tr>
<td>Cutting to depth ≤ 40mm</td>
<td>0</td>
<td>8 max</td>
<td>15 max</td>
</tr>
<tr>
<td>Cutting to depth &gt; 40mm where the floor of the cut is asphalt or bound material</td>
<td>10 max</td>
<td>5 max</td>
<td>15 max</td>
</tr>
<tr>
<td>Cutting to depth &gt; 40mm where the floor of the cut is unbound material</td>
<td>15 max</td>
<td>5 max</td>
<td>15 max</td>
</tr>
<tr>
<td>Cutting to depth within nominal 40mm of the surface of a Concrete Structure and/or waterproof membrane that is to be retained</td>
<td>0</td>
<td>8 max</td>
<td>10 max</td>
</tr>
<tr>
<td>Producing a surface suitable for spray sealing without prior correction</td>
<td>Not specified</td>
<td>Not specified</td>
<td>10 max</td>
</tr>
<tr>
<td>Milling to achieve specified level</td>
<td>10 max</td>
<td>0</td>
<td>Not specified</td>
</tr>
<tr>
<td>Producing a surface to optimise ride quality</td>
<td>5 max</td>
<td>5 max</td>
<td>Not specified</td>
</tr>
<tr>
<td>On Concrete Bridge Element</td>
<td>0</td>
<td>8 max</td>
<td>10 max</td>
</tr>
</tbody>
</table>

Depth of cut and other associated terminology is shown in Figure 14.1 and Figure 14.2 below.

**Figure 14.1 Where “Nil” tolerance on depth of cut applies for “Greater than specified”**
Figure 14.2 Where above and below depth of cut has been specified

![Diagram showing depth of cut and tolerance](image)

Table 14.2 Tolerances for Cold Milling Operations

<table>
<thead>
<tr>
<th>Activity</th>
<th>Limits/tolerances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuts of cold milling machine</td>
<td></td>
</tr>
<tr>
<td>Difference in levels between adjacent runs, depths and surface levels</td>
<td>&lt; 5mm</td>
</tr>
<tr>
<td><strong>Temporary ramps</strong></td>
<td></td>
</tr>
<tr>
<td>Dimensions for transverse joints</td>
<td>Speed limit &gt; 60km/h: minimum taper length of 2.5m per 50mm variation in levels.</td>
</tr>
<tr>
<td></td>
<td>Speed limit ≤ 60km/h: minimum taper length of 1.5m per 50mm.</td>
</tr>
<tr>
<td>Dimensions for longitudinal joints</td>
<td>Provide a ramp of minimum 1.0m length for each 50mm variation in levels.</td>
</tr>
<tr>
<td>Interface with structures</td>
<td>Provide ramps with a minimum taper length of 1.5m for each 50mm depth of cut.</td>
</tr>
<tr>
<td><strong>Methods of forming ramps</strong></td>
<td></td>
</tr>
<tr>
<td>Bevelling</td>
<td>Ensure any lip remaining at the toe or head of the bevel does not exceed 10mm in height.</td>
</tr>
<tr>
<td>Cold mix asphalt</td>
<td>Maximum thickness ≤ 40mm. Where site conditions require greater thickness, place the cold mix asphalt and compact in layers between 25 and 30mm thick.</td>
</tr>
<tr>
<td>Levelling of stockpiles</td>
<td>Height = 2m with uniform shape.</td>
</tr>
</tbody>
</table>

14.4 Milled Surface

Following the cold milling operation remove all loose material from the road pavement, gully pits and median areas.

Sweep the pavement and leave the site in a clean and tidy state. Remove all cold milled material from the site and transport to stockpile site(s) or otherwise remove from the site as directed.

Prior to covering the milled surface, arrange to inspect the surface with Council’s Representative prior to the removal of milling equipment from site.
14.4.1 Unsuitable Material

The Service Provider shall remove any planes of weakness within the asphalt, cement, concrete and/or pavement materials, or any unsuitable material existing at the base of the cut, which is not removed by the milling operation to the extent directed by the Council’s Representative.

14.5 Clean Up and Disposal of Milled Material and Temporary Ramp Material

The Service Provider shall at the completion of cold milling, remove all loose milled material. The material removed will become the property of the Service Provider unless otherwise specified.

If the milled material remains the property of Council, deliver the milled material to the nominated stockpile site(s). Shape the milled material in uniform stockpiles with regular sides and, where appropriate, slope the top to promote water runoff. Clearly identify the milled material by signposting.

If the milled material becomes property of the Service Provider, remove it from the site in accordance with the Waste Management Plan.

The Service Provider shall notify Council’s Representative, before the commencement of milling operations, how and where the milled material will be reused, recycled, stockpiled or disposed of.
Section 15 - Restoration and Finishing of Surfaces

This section covers the requirements for reinstatement, restoration and finishing of surfaces other than pavement surfaces, concrete path surfaces or other hard surface treatments.

Areas to be landscaped shall be finished in accordance with the approved Landscape Plan.

Areas for Vegetation Management shall be finished in accordance with the approved Vegetation Management Plan.

15.1 General Requirements

15.1.1 Removal of Rubbish and Excess Materials

All rubbish, excess construction materials, timber, loose roots and other materials not to be incorporated into the works must be removed from the site progressively and at the completion of site works.

15.1.2 General Surface Grading

Unless otherwise shown on the drawings all disturbed areas shall be graded to an even surface. The finished surface shall not have ridges and hollows that pond or direct runoff in other than a sheet flow fashion. Ridges shall be trimmed and depressions filled as necessary to produce a surface which will drain freely and is suitable for the operation of tractor-mounted mowers. Regraded areas are to be shaped and graded at a minimum of 1% to avoid depressions and to generally direct surface flow to the drainage system designed for that catchment.

Concentrations of surface water shall not be diverted towards trees. Filling within natural drainage paths is not to cause permanent or semi-permanent increases in the levels of the water table or standing water surface levels where upstream trees would be adversely affected. The diversion of natural drainage flows away from existing trees shall be avoided. Measures shall be taken to maintain existing surface and subsurface flows about retained vegetation and through the site.

Provisions must be made along the toe of the fill batters or base of retaining walls to permit the free passage of stormwater and subsurface water away from adjoining properties. Reductions in stormwater disbursement from adjoining properties shall not be permitted.

15.1.3 New Surface Treatments

The following requirements apply to all exposed areas not to be treated in accordance with an approved Landscape Plan.

All disturbed areas not to be landscaped in accordance with the approved Landscape Plan shall be scarified, topsoiled, seeded and straw mulched with bitumen binder in accordance with the requirements of Section 15.1.10 Turf, unless otherwise described on the approved drawings or documentation.
All areas used for access tracks and any areas compacted by vehicles, stockpiles or storage of materials shall be ripped to a minimum depth of 300mm regardless of the requirements of 5.1.2 Soil and Water Management, Erosion and Sediment Control. Stones and rocks larger than 50mm shall be removed from the surface after ripping.

Ripping will not be required where rock outcrops are evident.

Proposed lot areas are to be topsoiled, seeded and straw mulched with bitumen binder upon completion of grading to final surface levels. Cut and fill road batters are to be topsoiled, stabilised with jute mat or equivalent and revegetated unless an alternative treatment is approved.

Temporary fencing of areas once topsoiled and undergoing revegetation shall be installed by the Service Provider. Fencing shall be as required to effectively discourage vehicular access.

15.1.4 Verges

Verges shall be scarified and topsoiled in accordance with the requirements Section 15.1.9 Topsoil and turf placed in accordance with Section 15.1.10 Turf.

15.1.5 Pavement and Hard Surfaces

All hard surfaces shall be swept clean at the completion of the works. All rubbish, soil and other materials resulting from the sweeping are to be removed from the site.

15.1.6 Restoration of Existing Surface Finishes

Unless otherwise shown on the approved drawings or covered elsewhere in this Specification, all existing surfaces finishes that are disturbed during construction are to be reinstated to the requirements of this Specification. In the case of private property surface restoration shall be as agreed between the property owner and Service Provider.

15.1.7 Surface Defects

Any surface treatment, that in the opinion Council’s Representative becomes defective during the defects liability period as a result of normal usage, shall be removed and replaced and be subject to a further defects liability period.

15.1.8 Finishing Adjacent Surfaces

Areas immediately adjacent to all concrete element shall be topsoiled and turfed as shown in Council’s Civil Works Specification – Standard Drawings or as required by landscaping or Vegetation Management Plan requirements.

Adjacent surface levels to concrete elements shall be finished so that they do not intercept, pond or concentrate stormwater sheet flows.
15.1.9 Topsoil

All disturbed areas, including fill areas must be scarified to a minimum depth of 75mm and top dressed with topsoil to a minimum depth of 75mm. Once topsoiled, the area is to be revegetated as shown on the approved drawings and as detailed in this Specification.

Topsoil shall comply with AS4419 – Soils for Landscaping and Garden Use. In the case of topsoils stripped from the site some modification to the soil may have to be made by mixing additional materials.

Topsoil sourced from the site shall be used first in preference to importing topsoil. Topsoil sourced from the site is not to contain stumps, roots, clay lumps or rocks greater than 25mm diameter.

Site topsoil shall not be modified where an approved Vegetation Management Plan specifies soils to be used in their natural state or similar.

15.1.10 Turf

Turf or grass sods should consist of dense, well-rooted, vigorous growth turf with 25mm of approved topsoil attached. The sods should be free of noxious weeds, soil pests and diseases. The sods are to be cut by an approved sod cutter in long lengths of uniform width of not less than 300mm and are to be in a sound unbroken condition.

The turf species, where not specified on the construction drawings or in Council’s Civil Works Specification – Standard Drawings, shall be Buffalo for verges and Couch in all other areas. The use of Kikuyu grass is prohibited.

All areas should be scarified and then topsoiled in accordance with 15.1.9 above prior to the placement of turf. Laying of turf should be scheduled so that each section is rolled or tramped immediately after it has been laid to obtain a key with the underlying soil. Each row of turf should be butted hard against each other so that there are no gaps and the outside edge should be left staggered to form an uneven edge when strip turfing is not proposed.

Turf must be placed so stormwater sheet flow is not concentrated and does not cause erosion. To promote stormwater sheet flow runoff from the adjoining surface, turf must be set down to match the level of the adjoining area, or alternatively, the areas adjacent to the turf shall be graded to match the surface of the new turf.

Turf laid adjacent to concrete works shall be laid flush with the surface of the concrete. Excessive surface level differences between the turf and adjacent concrete will not be accepted. Turf shall be removed, topsoil regraded and turf re-laid as directed by Council’s Representative.

On batters, it is essential that the turf sections be laid along the contour, while in drains, turf sections should be laid across the drain at right angles to the direction of flow. The turf should be anchored with wire netting and pinned with rabbit bows on steep sites or drains to ensure stability in accordance with Civil Works Specification – Standard Drawings.

If the soil profile is hard, making penetration of rabbit bows difficult, lengths of reinforcing mesh, cut to size, should be used. It is essential that these bows, or rods, pin the netting hard against the
grass sods. It is better to shorten the bows, etc to achieve this than have the bows “flatten out” where penetration to the depth of the bows cannot be achieved. Removal of netting and bows is required after establishment where later maintenance, such as mowing, will be carried out.

Turf should be watered regularly for at least a week after it has been laid to ensure maximum rate of establishment. Afterwards, watering should be carried out as necessary for the duration of the work and subsequent maintenance period.

Dead and/or damaged turf is to be replaced immediately.

15.2 Compliance

15.2.1 Compliance Inspections
Compliance with this part of the Specification will be confirmed upon site observation by Council’s Representative.

15.2.2 Non-Complying Work
Where surface restoration and finishing of surface works are observed by Council’s Representative to not comply with this or any section of the Specification, the Service Provider will be instructed verbally or in writing of the non-compliance. The non-complying item(s) must be rectified prior to the final inspection.

15.3 Service Providers Responsibility for Site Security
The Service Provider is responsible for the theft or vandalism of any surface treatment up to the following milestones:

- Final inspection where the surface treatment is located on existing public land, road reserve or other Council maintained land; and/or
- Registration of the linen plan in the case of land being dedicated to Council.
Section 16 - Signage, Pavement Marking and Road Safety Barriers

16.1 General

This section of the Specification covers the supply and installation of signage, pavement marking and other pavement delineation, permanent traffic and pedestrian control devices and permanent safety barriers. This section of the Specification does not include traffic lights. Traffic lights are subject to Roads and Maritime Services approvals, specifications and installation compliance.

16.2 Supply and Installation

All signage, pavement markings and permanent traffic and pedestrian control devices shall be supplied and installed in accordance with current requirements of Roads and Maritime Services QA specifications, technical guidelines, technical directions and where not covered by Roads and Maritime Services documents, then in accordance with the AS1742 – Manual of Uniform Traffic Control Devices suite of standards.

Where signage, pavement markings and permanent traffic and pedestrian control devices shown on the approved drawings conflict with the requirements of the Roads and Maritime Services and/or AS1742 suite of standards, Council’s Representative shall be requested to confirm what measures are required.

Where signage, pavement markings and permanent traffic and pedestrian control devices for a particular situation are required by the Roads and Maritime Services and/or AS1742 suite of standards and there is no requirement shown on the drawings, then Council’s Representative may direct the Service Provider to install appropriate measures.

16.2.1 Road Name Signage

Road name signage shall be supplied and installed in accordance with AS1742. All road names shall be gazetted or approved by Geographical Names Board as per the NSW Address Policy. Confirmation of road names, correct spelling and road type i.e. Street, Avenue, Close, etc shall be obtained by the Service Provider from the approved drawings. Confirmation of wording for other Council signage shall be obtained from Council’s Representative. The technical characteristics of signs shall be in accordance with Council’s Civil Works Specification – Standard Drawings. No advertising of manufacturer’s name shall be permitted unless prior written approval is provided by Council’s Representative.

16.2.1.1 Lettering

The letter used on the road name signs shall be as detailed in Civil Works Specification – Standard Drawings. Use road type abbreviations as shown in table below, where not specified on the approved engineering drawings or Standard Drawings:
### Table 16.1 Road Type Abbreviations

<table>
<thead>
<tr>
<th>Type</th>
<th>Abbreviation</th>
<th>Type</th>
<th>Abbreviation</th>
<th>Type</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alley</td>
<td>ALY</td>
<td>Crescent</td>
<td>CR</td>
<td>Parade</td>
<td>PDE</td>
</tr>
<tr>
<td>Arcade</td>
<td>ARC</td>
<td>Drive</td>
<td>DR</td>
<td>Parkway</td>
<td>PWY</td>
</tr>
<tr>
<td>Avenue</td>
<td>AVE</td>
<td>Esplanade</td>
<td>ESP</td>
<td>Place, Plaza</td>
<td>PL</td>
</tr>
<tr>
<td>Boulevard</td>
<td>BVD</td>
<td>Expressway</td>
<td>EXP</td>
<td>Promenade</td>
<td>Prom</td>
</tr>
<tr>
<td>Brace, Brae</td>
<td>BR</td>
<td>Freeway</td>
<td>FWY</td>
<td>Quay</td>
<td>QY</td>
</tr>
<tr>
<td>Chase</td>
<td>CH</td>
<td>Gardens</td>
<td>GDNS</td>
<td>Road</td>
<td>RD</td>
</tr>
<tr>
<td>Circle, Circlet</td>
<td>CIR</td>
<td>Glen</td>
<td>GL</td>
<td>Square</td>
<td>SQ</td>
</tr>
<tr>
<td>Circuit</td>
<td>CCT</td>
<td>Grove</td>
<td>GR</td>
<td>Street</td>
<td>ST</td>
</tr>
<tr>
<td>Close</td>
<td>CL</td>
<td>Highway</td>
<td>HWY</td>
<td>Terrace</td>
<td>TCE</td>
</tr>
<tr>
<td>Corner</td>
<td>CNR</td>
<td>Junction</td>
<td>JNC</td>
<td>Walk</td>
<td>WK</td>
</tr>
<tr>
<td>Court</td>
<td>CT</td>
<td>Lane</td>
<td>LA</td>
<td>Way</td>
<td>WY</td>
</tr>
</tbody>
</table>

### 16.2.2 Other Signage

Where shown on the drawings or directed by Council’s Representative other signage may be required. Other signage shall be installed in accordance with the relevant Australian Standard(s). Where details of the type and size of other signs are not specified on the approved drawings the Service Provider shall provide details of the proposed signage to Council’s Representative for approval prior to ordering and installation of the signs.

Suburb names to be 125mm on 200mm wide blade.

### Table 16.2 Colour of Signs

Council will specify colours required, commonly used combinations include the following:

<table>
<thead>
<tr>
<th>Sign Type</th>
<th>Letter Colour</th>
<th>Reflective Background Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suburb Name</td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Direction Sign</td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>Emergency Facilities</td>
<td>White</td>
<td>Red</td>
</tr>
<tr>
<td>Tourist Information</td>
<td>White</td>
<td>Brown</td>
</tr>
<tr>
<td>Public Services and Facilities</td>
<td>White</td>
<td>Blue</td>
</tr>
<tr>
<td>Local Information Service</td>
<td>White</td>
<td>Green</td>
</tr>
</tbody>
</table>
16.2.3 Installation of Signs

Signs shall be installed in accordance with Council’s Civil Works Specification – Standard Drawings.

Details of the proposed post holders are to be provided to Council’s Representative for acceptance prior to installation.

Signs erected within the verge shall provide minimum of 2.2m clearance, or 2.5m clearance over footway areas and paths, from finished ground level and minimum 300mm behind face of kerb, or 600mm minimum behind the edge of bitumen.

16.3 Pavement Markings

All pavement markings on roads, including lines, diagonals, chevrons, symbols and words, shall be installed in accordance with Roads and Maritime Services QA Specification R141 Pavement Marking and other applicable RMS publications and set out by a Surveyor and applied in white reflectorised thermoplastic paint (except yellow (C3) parking restriction lines), unless otherwise directed by Council’s Representative.

Retroreflective Raised Pavement Markers (RRPMs) shall be provided with all longitudinal pavement line marking on roads (except yellow (C3) parking restriction lines), unless otherwise approved by Council’s Representative. Pavement markers to be in accordance with AS1906.3 – Retroreflective materials and devices for road traffic control purposes - Part 3: raised pavement markers (retroreflective and non-retroreflective) – 2017 and Roads and Maritime Services QA Specification R142 Raised Pavement Markers and other applicable RMS publications.

All yellow (C3) parking restriction pavement marking lines on roads shall be applied in yellow reflectorised thermoplastic paint, unless otherwise directed by Council’s Representative.

All pavement markings on shared paths and bicycle paths, including longitudinal and transverse lines and symbols, shall be applied in white reflectorised road marking paint, unless otherwise shown in Council’s Civil Works Specification – Standard Drawings, or unless otherwise directed by Council’s Representative.

The Service Provider shall be responsible for the maintenance and replacement, if necessary, of raised pavement markers and all pavement markings until the expiry date of the defects liability period. Unless pavement markings are being travelled over by the Service Provider’s construction vehicles, the Service Provider’s liability in this regard does not include damage through normal wear and tear.

All spillages shall be immediately cleaned up by the Service Provider. The Service Provider shall incur the costs of any restoration work required, in the opinion of Council’s Representative to restore the surface to its original state.
16.4 Road Safety Barriers

Road Safety Barriers shall be supplied and installed to comply with the requirements of Roads and Maritime Services Specification R132 Safety Barrier Systems. The following clarification shall be applied when using R132:

- “Superintendent” or “Principal” shall mean “Council’s Representative”.
- A “Project Quality Plan” is not required.
- Documentation required in Annexure R132/D shall be provided when requested by Council’s Representative.
- Referenced documentation shall be current at the date of the preconstruction site meeting.
- Hold points shall not be applicable unless requested by Council’s Representative.
- All materials are to be supplied by the Service Provider.
- The basis of measurement and payment does not form part of this Specification.
- The location of safety barrier shall be as shown on the approved drawings.
- Waste resulting from installation of safety barriers shall be removed from the site by the Service Provider.
- Setting out shall be sufficient to construct the safety barrier to the alignment as designed.
- Traffic Control is to be provided in accordance with Section 4 - Traffic Management of this Specification.

Mowing strips a minimum of 300mm wide (depending on the safety barrier type) and 100mm thick on 100mm compacted gravel with jointing type and locations appropriate for the purpose is required.

Rub rails or safety railings are to be provided to the rear of the safety barrier where there is an adjoining pedestrian or shared path system.

16.5 Compliance

16.5.1 Compliance Inspections and Documentation

Compliance with this section of the Specification will be confirmed upon site observation by Council’s Representative.

All signage, pavement markings, permanent traffic control devices and safety barriers installed and/or removed as part of the works shall be shown on the work-as-executed drawings.
16.5.2 Non-complying Work

Where signage, pavement markings, permanent traffic control devices and safety barriers are observed by Council’s Representative to not comply with this or any section of this Specification, the Service Provider shall be instructed verbally or in writing of the non-compliance. The non-complying item(s) shall be required to be rectified prior to the final inspection.
Appendix A - Work-as-Executed (WAE) Drawings

Work-as-executed (WAE) drawings and related documentation shall be provided to Council’s Representative for approval prior to handover of works.

For development related works Compliance Certificates for any works shall not be issued prior to Council’s Representative accepting the WAE drawings and documentation showing all the required information.

A.1 Information Required on WAE Drawings

WAE drawings shall show works have been constructed as shown on the approved drawings and in accordance with this Specification, to the approved line, level and specification tolerances.

WAE drawings shall be prepared and certified by a Registered Land Surveyor in the State of New South Wales or a suitably qualified Engineer. Internal Council works may be certified by a staff Surveyor.

WAE drawings shall have the following notation on each drawing set written in red and signed by the certifying Surveyor and/or Engineer:

“I certify that:
(1) All construction has been carried out in accordance with the attached engineering drawings and the Specification and with regard to location and level, is as shown in red ink or with variations shown in red ink thereon.
(2) All drainage works are situated within drainage easements and/or reserves as shown on the Deposited Plan.
(3) All construction within private land has appropriate easements, right-of-way, or like restriction over the whole of the structure.
Date: __________________________
Printed Name: __________________________
Signature: __________________________

WAE drawings shall be prepared using the approved design and construction drawings as a base in order to identify compliance with the approved drawings and to highlight changes that may have been required during construction.

All WAE information shall be provided in red and shall consist of:

- A red tick on approved drawing(s) next to level, note or label where the WAE information is the same as that on the approved drawing.
- New level(s), note(s) or label information in red where WAE information is different from the approved drawings and the original approved information struck through in red.
- New plan and section detail line(s) and symbol(s) shown in red and original approved plan and section detail line(s) and symbol(s) crossed out with a series of small crosses in the case of lines or a single cross in the case of a symbol.
Additional details required to be shown on all WAE drawings include:

- All levels shall be in AHD.
- All coordinates shall be MGA.
- Finished levels and horizontal alignment of concrete kerb and gutter, vehicle access crossings and other concrete works.
- All signage, pavement markings, permanent traffic control devices and safety barriers installed or removed as part of the works.

The WAE plans shall be submitted in an electronic and hard copy format to Council’s Representative for approval. The electronic file format shall be high resolution Portable Document Format (.pdf) or other acceptable format with all pages of the plan contained in a single file.

For Council internal construction projects, any additional WAE information files may be added directly to the relevant electronic document management system (TRIM/ECM Project/Contract Index) and referenced on the WAE drawing, or by direct transfer of WAE data into Council’s Asset Management System and GIS.

**A.2 Roadworks and Pavement Details**

The Service Provider in collaboration with the Consulting Geotechnical Engineer shall prepare WAE drawings, using the approved construction drawings as a base, showing the extent of as constructed pavement thicknesses and the location and results of all relative compaction testing carried out for the works.

The legend for each pavement type shall indicate the thickness of subgrade replacement, select material, subbase, base or any other pavement layer that may have been incorporated into the works.

The following information is required on the WAE drawings in addition to those listed in A.1 above:

- Finished surface levels of road pavements and elsewhere in the road reserve or proposed road reserve.
- As-constructed levels on top of the pavement subbase layer and base layer. Levels shall be presented in a tabular form which references the chainage and sufficient levels to define the surface of each layer.
- Finished surface levels of stormwater drainage channels and associated structures.
- Finished surface levels and location of major concrete structures and other structures that may form part of the approved works.

**A.3 Stormwater Drainage Details**

The following information is required on the WAE drawings in addition to those listed in A.1 above:

- Finished surface levels at all pits and other structures.
- Finished surface levels between pits and other structures.
• Location of finished surface levels taken labelled (e.g. top of kerb, centre of headwall, centre of grate, centre of concrete lid).
• Finished invert levels for pits, other structures, pipes and box culverts.
• Changes to the horizontal position of any pits, other structures, pipes and box culverts.
• Confirmation of the installed pipe diameter.
• Pipe material and class of pipe.
• Confirmation of the size of installed box culverts.
• Pipe or box culvert grades.
• Locations of subsurface drainage cleanouts and outlets.
• Details of overland flow path.
• Finished invert levels, top of bank levels, base width, top width, base/wall material for open channels.
• Manufacturer/model number of any proprietary drainage structure.

A.4 Earth-Retaining Structures

When retaining structures have been constructed, the following information is required on the WAE drawings, in addition to those listed in A.1 above, including all details required on approved drawings but not limited to the following:

• Component type.
• Component size.
• Buried components.
• Subsurface drainage and flush points.
• MGA coordinates at each end of each site.
• Plan showing:
  o Horizontal alignment at toe.
  o Horizontal alignment at top.
  o Horizontal alignment of buried components; rock bolts, tie backs, etc.
• Longitudinal section.
• Typical cross section showing:
  o Footings.
  o Chainages at each end of each site.
  o Zone of influence for loading at back of retaining structure.
  o Zone of influence for excavation at toe of structure.
• Photo mosaic(s) of components before covering.
• Photo mosaic(s) are required when stabilisation works involve multiple types of work including rock removal, geotechnical and structural specifications.

• Quality Assurance (QA) documentation requested by the approved drawings, Geotechnical and/or Structural Engineer confirming that specifications or acceptable equivalent have been met. These shall be accompanied by a compliance report certified by the Engineer(s).

Any retaining structure with covered, buried or in other ways hidden components shall require photo mosaic(s) of components before covering e.g. rock bolts and mesh pre-shotcrete, in addition to the above requirements, as part of the WAE documentation.

A.5 Water Supply Infrastructure

• Reticulation mains – all installation details as shown on the design drawings.
• Trunk mains – all installation details as shown on the design drawings.

A.6 Sewerage Infrastructure

• Gravity sewer – all installation details as shown on the detailed design drawings.
• Sewer rising mains – all installation details as shown on the detailed design drawings.
• Pump stations – all installation details as shown on the detailed design drawings.