



# GUIDELINES FOR RURAL ROAD DESIGN AND CONSTRUCTION TECHNICAL SPECIFICATION

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Shire of Wyndham East Kimberley

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## INTRODUCTION

### PART 1 DESIGN REQUIREMENTS & APPROVAL PROCESS

### PART 2 TECHNICAL SPECIFICATIONS

### PART 3 STANDARD DRAWINGS

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## INTRODUCTION

This document is the first edition of the Shire of Wyndham East Kimberley Guidelines for the Design and Construction of Rural Roads. It is a Controlled Document (refer to the provisions stated in this section) and it is the users responsibility to ensure that they are referring to the most current edition of the Guidelines.

The document remains unique to the specific requirements of the Shire of Wyndham East Kimberley (SWEK) while reflecting relevant Acts, Australian Standards, Governmental Guidelines that govern construction works throughout Western Australia.

The document is aimed at providing a clear, structured and practical set of construction requirements by outlining minimum material specifications and standard construction requirements for rural roads constructed in the Shire of Wyndham East Kimberley.

## DISCLAIMER

The Guidelines shall be read in conjunction with relevant legislation and any SWEK approved policies or documentation.

All due care has been taken in producing these Guidelines and its consistency with relevant legislation and standards however if any inconsistency is noted SWEK will provide the necessary clarifications. SWEK does not guarantee the completeness of the information contained within these Specifications and does not accept any loss or damage that may result from the use of the Specifications.

SWEK reserves the right to deviate from particular aspects of the Specifications for any rural road where it deems it to be warranted.

The Developer (or its Consultants) is responsible for ensuring that all works are are constructed in accordance with the technical requirement set out in this document.



## DOCUMENT CONTROL PROVISIONS

### CONTROLLED DOCUMENT

The guidelines for design and construction of rural roads is a controlled document with the latest edition available for purchase (hardcopy and/or electronic PDF format) from Shire of Wyndham East Kimberley or available free (PDF format) via Shire of Wyndham East Kimberley's website.

The Shire of Wyndham East Kimberley will always retain the copyright for the Guidelines and will retain the Master Copy.

It is the Developer or Consultant's responsibility to ensure that they are referring to the latest edition of the document.

### DOCUMENT AMENDMENT CONTROL

These Specifications are a "living" document and will be subject to changes / revisions from time to time, to maintain relevance to SWEK's policies, evolving best practices and procedures and changing industry standards.

Suggestions for changes to the Specification will be welcomed and may be initiated externally or from within SWEK.

To maintain the integrity of the document, the following protocol will apply to proposed changes.

- Make request / proposals for change on the "**Guidelines Amendment Request**" form (Refer to Appendix A).
- Submit the completed form to the Development Officer at Shire of Wyndham East Kimberley. SWEK will then consider the request.
- All requests for amendments will be acknowledged within two weeks of receipt and responded to within three months, giving the reasons for adoption or rejection.
- No changes will be implemented until the Officer has endorsed the amendment. The Specification will then be updated and reissued as a New Edition.



## GUIDELINES STRUCTURE AND CONTENT

The Guidelines and Technical Specification is presented in three (3) parts with an additional Introduction Section.

The Parts are divided into sequential sections however the Technical Specification should always be interpreted as a total document and read in conjunction with the Design Guidelines.

The Parts and general description as to what it covers is as follows:

**INTRODUCTION**     *The Introduction covers the general intent of these Guidelines and Technical Specification, Document Control and Definitions used within the Technical Specification.*

**PART 1**                    **DESIGN AND CONSTRUCTION REQUIREMENTS**  
  
*This Section outlines the technical requirements and standard of construction required for works within the Shire.*

**PART 2**                    **MATERIAL SPECIFICATION**  
  
*This section covers the minimum standard of materials used in the construction works within the Shire.*

**PART 3**                    **STANDARD DRAWINGS**  
  
*This Section covers the specific standard requirements and profiles for construction works within the Shire.*



## DEFINITIONS

The following is the definition of specific wording and terms used throughout the guidelines.

<b>Access</b>	Provision of infrastructure to cater for the adequate movement of vehicles, pedestrians and cyclists to each allotment.
<b>Approved Drawings</b>	Those Drawings submitted by the Developer or Consultant and approved by the Officer for construction purposes. If no Drawings are submitted or the submitted Drawings are deficient then the Standard Drawings shall be deemed to be the Approved Drawings be it in part or full.
<b>Building Code of Australia</b>	The current version of the Building Code of Australia
<b>Certifier</b>	The person engaged to certify the construction work. (Ideally this person should not be the Superintendent).
<b>Consultant</b>	The Consultant(s) and/or their duly authorised representatives(s) appointed by the Developer to undertake various design and/or construction Certification associated with a Subdivision or Development.
<b>Contractor</b>	The person bound to execute the Rural road Design and Construction.
<b>SWEK</b>	The Shire of Wyndham East Kimberley
<b>SWEK Property</b>	Any land owned or maintained by SWEK, either by licence, statutory requirement or agreement.
<b>Defect</b>	An unsatisfactory or non-complying item of work noted by the Superintendent, Certifier or Officer. All defects are to be rectified to the satisfaction of the Officer.
<b>Disability Discrimination Act</b>	The Federal Government of Australia Disability Discrimination Act 1992 and any amendments made thereto. (DDA)
<b>The Officer</b>	The Chief Executive Officer of the SWEK or the duly authorised or delegated person acting on behalf of the Officer in the matter(s) of development – usually the SWEK’s Executive Manager Engineering and Development Services or an authorised representative.
<b>Practical Completion</b>	The stage reached when all works have been constructed to the true intent and meaning of the Approved Drawings and Technical Specification; the whole of the works being able to be used for the purpose for which they have been designed and on the proviso that the relevant requirements of the Development Permit have been complied with. The Officer is the only person that can deem Practical Completion.





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<b>Road Hierarchy</b>	That classification of roads as adopted by SWEK, into a series of categories dependent upon functionality.
<b>Standard Drawings</b>	The current SWEK Standard Drawings.
<b>Superintendent</b>	The person employed to oversee the progress and standard of site works and concurrency with the Technical Specification. Generally the consultant fills this position.

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# **PART 1**

## **DESIGN REQUIREMENTS & APPROVAL PROCESS**

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## 1 GENERAL REQUIREMENTS

### 1.1 SCOPE

This section deals with design and approval process involved in the design and construction of new roads and the upgrading of existing rural roads within the Shire of Wyndham East Kimberley.

### 1.2 THE ROLE OF SWEK IN THE DEVELOPMENT & CONSTRUCTION OF ROADS

The construction of rural roads within the Shire requires the approval of the Shire as the roads are to be constructed on a Shire Road reserve and will become a Shire Asset. Ultimately the Shire is responsible for the operation and maintenance of all rural roads within the Shire.

SWEK is specifically responsible for:

- Maintenance and management of most public roads and verges;
- Traffic control;
- Foreshore protection;
- Stormwater drainage;
- SWEK owned land and public spaces.

In the case of new roads or substantial re-development of existing roads, SWEK has the right under the LGA to require the upgrading of all assets such as roads and drains, line markings and signage.

### 1.3 PRELIMINARY CONSULTATION WITH SWEK

The provision of upgrading existing roads or the construction of new roads will require the approval of SWEK. It is recommended that prior to undertaking the design of a new road or upgrading an existing road consultation is undertaken with SWEK.

SWEK issues requiring discussion during the initial design process are as follows:

#### ***Stormwater Drainage***

- Design, construction and maintenance of drainage structures,
- Design and construction requirements for rural catchments
- Connection to existing drainage infrastructure
- Upgrading of existing drainage infrastructure
- Requirements for new stormwater drainage easements

#### ***Environmental Matters***

- Environmental management issues
- Erosion and sediment control
- Stormwater management
- Dust suppression



### **Roads, Traffic And Vehicular Access**

- Roads layout and design
- Intersection treatments
- Projected traffic volumes
- Design speeds
- Proposed road pavements and road widths
- Clear zones
- Gravel pavements – sourcing appropriate gravel
- Provision for spray sealing
- Traffic control during construction road closures and detours during construction

#### **1.4 PREPARING AND LODGING AN APPLICATION TO CONSTRUCT A NEW ROAD**

Developers or private land owners wishing to upgrade or construct a new road within the Shire on an existing road reserve must make application in writing to SWEK notifying their intent to undertake the design and construction of the road. No approval to undertake construction will be granted until such time as detailed design drawings are approved and stamped by Council.

#### **1.5 AGENTS AND CONSULTANTS**

Depending upon the nature of the application, the applicant can seek professional assistance from engineering consultants other consultants may be engaged as required. Consultants need to hold recognised qualifications and be acceptable to SWEK.

#### **1.6 ASSESSMENT BY SWEK**

SWEK employs planners, engineers and other technical staff to provide proper advice to the elected members (Councillors) regarding development within the Shire.

SWEK staff assesses the application. This usually includes an on site inspection and may include SWEK speaking with the applicant to clarify matters if necessary.

In addition to matters for which SWEK has statutory responsibility under the Local Government Act, the submission is assessed by SWEK in terms of the current Planning Scheme and any declared Land Use Objectives for the area. Specific review of the stormwater requirements may be required and this may involve SWEK requesting that a detailed drainage study be undertaken for the application

SWEK staff's recommendations to the elected members are generally framed in terms of support for the proposal, either conditional or subject to conditions or objecting to the proposed works for specific reasons.

#### **1.7 THE CONSTRUCTION PERMIT**

Once all fees and bonds and the executed deed of agreement have been provided a construction permit will be provided with the approved and stamped plans, this may include additional requirements or conditions that SWEK require to be undertaken as part of the





works. The procedures required by SWEK are set out in detail in the following sections of these Guidelines.

## 1.8 DEVELOPER ACCOUNTABILITY

A responsible and accountable approach is required of the Developer and the Developer's Representative(s). The Developer will be held entirely accountable for all actions during the design and construction process.

The Developer will be required to enter into a Deed of Agreement with SWEK, including the lodgement of a Security / Performance / External Works bond as noted in this Section of the Guidelines.

In particular it is expected that the SWEK's requirements are adhered to, particularly in the areas of programmed construction inspections, environmental controls, testing and certification during construction.

### 1.8.1 Developer Liabilities and Insurances

The Developer is to be responsible for all damage to existing facilities, services and structures in both public and private ownership sustained as a result of the new road construction.

Sufficient public risk insurance must be carried by the Developer to cover the proposed road. The insurance is to specifically indemnify SWEK. Evidence of appropriate insurance must be demonstrated prior to commencement of any construction works.

### 1.8.2 Developer To Discuss Proposal

It is imperative that Developers discuss their proposals with SWEK at an early stage ensuring that all conditions and requirements have been negotiated, agreed and understood prior to the issue of the approval to commence contraction.



## 2 STATUTORY REQUIREMENTS

### 2.1 THE WEST AUSTRALIAN LOCAL GOVERNMENT ACT

The West Australian Local Government Act sets out SWEK's powers to prescribe standards and procedures for development within the Shire.

### 2.2 OTHER ACTS AND REGULATIONS

All Acts and Regulations administered by the relevant Government Authorities are to be complied with throughout the development process.

### 2.3 WORK HEALTH ACT WA & WORK HEALTH (OH&S) REGULATIONS

The Developer's attention is specifically drawn to the requirements of the current Work Health Act & Work Health (OH&S) Regulations, Clean Air Regulations, Environmental Protection Act and other relevant Acts.

The Developer must understand the ramifications of any actions that are not in accordance with these and other legislative requirements and regulations.

In the case of a development by the Developer, OH&S documentation providing proof of the Contractors Safety Management System detailing how OH&S and General Risk Management is to be achieved and sustained, is to be provided to SWEK by the Consultant.

The safety of the general public, contractor's employees and road users and maintaining accesses to private property is paramount and details of how this is to be achieved is to be included on the project drawings and in the project specifications.

### 2.4 CLEAN AIR REGULATIONS AND ENVIRONMENT PROTECTION ACT

Details of how dust suppression and sand drift control is to be carried out and how erosion and sediment is to be controlled, are to be shown on the project drawings and in the specifications.

In locations where wind borne dust and sand may result in significant problems to the public or the environment and/or where wet season conditions will result in significant soil and silt transportation, SWEK may require an Erosion and Sediment Control Bond to be lodged by the Developer. Lodgement may be required with the design drawings as a condition of approval or at Practical Completion as a requirement for Acceptance, On Maintenance and Title release.



### 3 SWEK REQUIREMENTS

#### 3.1 APPROVED DOCUMENTS AND COMMENCEMENT OF WORKS

The Developer shall provide to SWEK for approval, all relevant designs, drawings and specifications for all proposed works associated with the construction of new roads to be taken over and maintained by SWEK.

Approval of Documents does not constitute permission to commence construction works.

#### 3.2 THE WORKS

The works covered by these guidelines may include, but are not be limited to, road works and associated earthworks and site works, stormwater drains, tail out drains, table drains owned or maintained by SWEK. The works are not necessarily restricted to works in the road reserve; they may also include external works associated with or affected by the proposed new road (such as erosion control).

#### 3.3 DEVELOPER TO ENGAGE CONSULTANTS

The SWEK may require the Developer to engage Consultant(s) and Superintendent(s) as necessary to design, construct and supervise the proposed works associated with the new road, to be taken over and maintained by SWEK.

#### 3.4 DEVELOPER TO PAY SWEK FEES

Where the Developer carries out the design and construction works, SWEK shall be paid on demand, an amount to cover reasonable costs incurred in administering, assessing and inspecting design and construction of the works as follows:

- i) A Design Approval Fee in the amount of 0.50 % of the Estimated Construction Cost of the works as estimated by the Developer or Consultant and approved by SWEK, to be paid prior to Design Approval;
- ii) A Construction Approval Fee in the amount of 0.50 % of the Actual Construction Cost of the works as declared by the developer or Consultant and approved by SWEK, to be paid prior to the works being accepted On Maintenance.
- iii) Construction Security Bond of 2.5% of the estimated construction cost of the works as XXX to be paid prior to Construction Approval.

#### 3.5 SWEK MAY CARRY OUT WORKS

Where Consultants and Superintendents have not been engaged by the Developer to design, construct and supervise the works, SWEK may be approached to carry out those activities subject to agreement by the Officer:

- i) A fee for administration, design, construction and supervision by SWEK, as far as it is able, commensurate with recommended consultants fees as approved by SWEK.
- ii) SWEK can provide the Developer with the names of suitable Consultants they may approach to undertake design and manage the construction of the subdivision.



### 3.6 DEED OF AGREEMENT

The Developer shall enter into a **DEED OF AGREEMENT** with SWEK for the proper execution of the works required for the development in accordance with the Guidelines prior to or at the time of the Officer issuing design plan approval.

The Deed is to contain among other things, a **SCHEDULE**, detailing all conditions and requirements for works, to be ultimately taken over and maintained by SWEK,

The **SCHEDULE** of conditions, requirements and agreements reached should have evolved as a result of the consultations, discussions, negotiations and agreements between SWEK and Developer during the Planning process.

The Developer is to lodge all securities and pay all fees required by the SWEK, as set out in the Deed prior to or at the time of the Officer issuing design plan approval.

The **NAME** appearing on the Deed and any other Agreement(s) or Bond(s) is to be the **NAME** of the Developer appearing on the application. SWEK will not enter into any dealings with the Developer unless the foregoing is the case.

An example of a Deed of Agreement is shown in the Appendix C.

### 3.7 MAINTENANCE AND SECURITY BONDS

The Developer is to lodge a Maintenance Bond with SWEK for an amount of 2.5% of the Actual anticipated Construction Cost of the new works at the time of the Officer approving design plans.

The Developer is to lodge any necessary Security Bond for an amount estimated to be the cost of all outstanding works or where a risk or liability has been identified. Estimates of works will be based on SWEK's current Fees and Charges where applicable.

Security Bonds may be required at any time during development, the amount of which is to be approved by the Officer.

### 3.8 PERMITS FOR WORKS ON LAND CONTROLLED BY OTHERS

Where works are to be carried out on land owned or controlled by other Authorities and private owners, suitably documented permission to construct is to be obtained from the relevant Authority or person. This is to be presented to the Officer prior to the commencement of works and a clearance obtained and presented at completion.

Works will not be accepted and placed On Maintenance until all necessary clearances are obtained and submitted to the Officer

### 3.9 OTHER AUTHORITIES

#### 3.9.1 Engineering Services and Other Authorities

Engineering services in the Shire of Wyndham East Kimberley are the responsibility of various Authorities, but not necessarily restricted to the following as listed below:

- Main Roads Western Australia (MRWA) for all road works and associated earthworks, drainage works, pathways, street lighting and street scaping for all roads defined and gazetted as being controlled by the West Australian Department of Main Roads;
- WaterCorp for all water supply and sewerage reticulation;
- The Department of Environment (DOE), for all matters concerning water quality, clearing, erosion and sediment control;



- Western Power for all electrical reticulation and power generation;
- Telstra or other Providers or Carriers (eg Aустar) for all communication facilities;
- Fire and Emergency Services Authority (FESA) for fire fighting requirements.

### 3.9.2 Approval Requirements

SWEK requires that approvals from Other Authorities be submitted prior to SWEK approving designs / construction. SWEK will not approve plans or construction without these approvals.

All proposals should be discussed with the Officer with respect to stormwater run-off quality and erosion and sedimentation control.

Plans and specifications must be submitted to each Authority for review and / or approval during the design period prior to commencement of construction.

Clearances, or approvals to construction will also be required by SWEK from the Authorities at completion of construction.

## 3.10 ENVIRONMENTAL, EROSION & STORMWATER MANAGEMENT ISSUES

### 3.10.1 General

Pollution of the sea, waterways, rivers, streams and drains can be caused by water borne and wind blown debris from road construction site. To cause or allow this is an offence under a variety of Acts, Regulations and By-laws.

Environmental matters such as clearing of vegetation, stormwater quality, stormwater drainage management and erosion and sediment control are critical to the responsible development of new roads and upgrading of existing roads.

Soil erosion and sedimentation, particularly as a result of clearing, stormwater run-off or wind effects, is a significant problem in any development whether in urban, rural or remote areas and results in inordinate economic, social, environmental and cultural costs to the Developer, SWEK and community.

The Developer has a responsibility to protect the natural assets and resources of the Shire and is totally responsible for clearing operations, erosion and sediment control and the quality of stormwater run-off during the overall development process.

In particular there is a significant and vital need to plan for, manage and maintain best practices for the control of erosion and sediment on any proposed new road or upgrade of existing roads.

The developer is to take all the above matters into consideration during all aspects of the development process.

### 3.10.2 Other Environmental Management Issues

As well as the engineering aspects of clearing, dust management, drainage and erosion control issues, there are other Environmental Management issues that must be addressed with any proposed new road are as follows.

These are generally categorised as:

- Aboriginal Land Claims and Native Title Claims;
- Coastal Development and/or Reclamation of Coastal Areas
- Flood or Storm Surge affected land



- Environmental Impacts and Heritage Planning -
  - Sacred Sites
  - Heritage or Archaeological Places or Objects
  - Beneficial Uses and Users
- Fire Management
- General Pollution
- Acid Sulfate Soils
- Use of Appropriate Fill Materials

All of the foregoing will require some form of approval, comment or input from The Department and all may require SWEK input and approval.

### 3.10.3 Erosion and Sediment Control – SWEK Responsibilities and Requirements

SWEK will not accept any polluted stormwater run-off into its drainage systems nor will it allow dust and sand drift to cause a nuisance to the detriment of the public or any SWEK or public asset.

SWEK has developed its stormwater drainage, erosion and sediment control requirements as set out in these Guidelines in conjunction and in line with best practice guidelines.

SWEK's requirements shall apply.

SWEK is also responsible for public safety and the effect or result of any work, construction and maintenance practice not in accordance with the applicable Acts and Regulations employed during the development process.

## 3.11 PRACTICAL COMPLETION, ON MAINTENANCE

### 3.11.1 Practical Completion

Defined as “the stage reached when all the works have been constructed to the true intent and meaning of the approved drawings and specifications; the whole of the works being able to be used for the purposes for which they have been designed provided that all requirements of the Approval Conditions having been complied with”.

### 3.11.2 Application For Works To Be Inspected For On Maintenance

Upon the Practical Completion of the works, the Consultant or developer representative is to notify the Officer in writing that the works have been completed in accordance with the approved drawings and specifications and request an inspection to have the works placed On Maintenance.

### 3.11.3 On Maintenance Inspection

The inspection will require the presence of the Officer, the Consultant and the Contractor. The Officer may have other special requirements to be attended to prior to inspection.

The On Maintenance Inspection Checklist is attached as Appendix E and has been produced to aid Consultants in their estimation of whether works have reached Practical Completion.



### 3.11.4 Outcomes of On Maintenance Inspection

As soon as possible after the inspection, the Officer will inform/confirm with the Developer any items not in accordance with the requirements of the drawings and specification and the conditions set out in the approval.

The items shall be divided into:

- Items requiring completion, repair or alteration prior to any approval for the works to be approved as On Maintenance. A further inspection of these works when completed or rectified shall be deemed to be an extension of the Practical Completion inspection. These works are to be completed prior to works being placed On Maintenance;
- Other items that may be completed, repaired or altered by an agreed date during the Maintenance Period. These works may require a Security Bond(s) to be lodged;
- Items that are to be monitored for performance during the maintenance period. These works may require submission of a Security Bond.

### 3.11.5 Items to be Submitted for Acceptance

The following information and documentation is then to be submitted for acceptance:

- As Constructed Drawings and Documentation;
- Completed On Maintenance Checklist;
- Certification of Works (Statement of Compliance), outstanding Materials and Compaction Test Results;
- Clearances from Other Authorities and Private owners where required;
- 0.5% Development Inspection Fee;
- 2.5% Maintenance Bond. The Security Bond may be rolled over if sufficient;
- Lodgement of all Outstanding Works Bonds (where required);
- Lodgement of Environmental Bond (where required).

When all works are completed in accordance with the above, the Officer shall issue the Consultant with an Acceptance and On Maintenance Certificate.

### 3.11.6 Bonding of Outstanding Works

SWEK requires works to be completed prior to Practical Completion rather than bonded, however in certain cases the Officer may allow bonding in lieu of outstanding works.

Cash bonds/payments are required for incomplete or outstanding works.

Unconditional Guarantees from a financial institution acceptable to SWEK are required for refundable items such as Security and Maintenance Bonds.

The name of the Developer appearing on the bond is to be the same as appears on the application and approval and other documentation lodged with SWEK.

The rates applicable to costings for these bonds, will be SWEK's current rates as set out in its Annual Fees and Charges. If no relevant rate exists, then the bond will be of an amount mutually agreed by both parties.



### 3.11.7 Environmental Bond

An Environmental Bond may be required, at the Officer's discretion, if it is considered that drainage, erosion and sediment control measures are not adequate or a perceived risk of erosion and sedimentation exists over the Maintenance Period. The bond will be of an amount determined by the Officer.

### 3.11.8 Bond Applications

If a bond for outstanding works is sought, the Developer is to lodge an application to the Officer requesting that the works be bonded. Applications are to be in writing and are to include the following information:

- Concise reference to the location, extent and nature of works to be bonded;
- A timetable for the future completion of the outstanding works;
- An itemised estimate of the cost of the works to be bonded;
- Reasons for requesting the bonded work;
- Any other information that will assist in the assessment of the application.

### 3.11.9 Maintenance Bond

A Maintenance Bond calculated at 2.5% of the certified cost of the works, is to be lodged prior to the Works being placed On Maintenance. This may be the security bond (2.5%) rolled over to become the maintenance bond.

The bond is to be held for the duration of the Maintenance Period and may be drawn upon by SWEK to carry out defect rectification, if after due process, no appropriate action is taken by the Contractor / Developer.

### 3.11.10 Bond Information

All bonds submitted to SWEK shall clearly state the following information:

- Name and address of the person or persons responsible for the payment or the arranging of the unconditional guarantee;
- The amount of the payment or unconditional guarantee;
- Name, stage and location of subdivision and Development Permit Number;
- A concise explanation of the purpose of the bond referring to all items for which it is to be utilised.

Compliance with the above submission requirements does not necessarily imply acceptance of the bond and each request shall be subject to acceptance by the Officer.

### 3.11.11 On Maintenance Certificate

When the foregoing requirements to have the works placed on Maintenance have been complied with, the Officer will issue the Developer with an On Maintenance certificate (refer Appendix F).

The certificate will have no effect until both the Officer and the Developer have signed and dated the document.





## 3.12 MAINTENANCE PERIOD

### 3.12.1 Maintenance Period (Defects Liability Period)

Defined as “The statutory period, in which the Works, having been deemed to be Practically Complete and Accepted and placed On Maintenance by the SWEK, are to remain the responsibility of the Developer, to care for and maintain and repair any and all defects resulting from design errors or omissions, faulty workmanship and/or defective materials.”

The responsibilities and the requirements of the developer are set out in the following.

### 3.12.2 Civil Works Maintenance Period

Civil works generally refer to roads and drainage associated with the new road.

For works carried out on solid ground, the normal defects liability (maintenance period) is 12 months, however if there are special circumstances, SWEK may decide that a longer period is required: ie, over two wet seasons and one dry season.

### 3.12.3 General Maintenance & Defects Requirements & Responsibilities

The following is a list of maintenance and defects liability period requirements for all works applicable to the new roads and includes, but is not limited to:

- Maintain to the manufacturer's and SWEK's specifications and requirements all structures located within the defined development;
- Undertake maintenance grade of gravel road at least once during the maintenance period (The developer may wish to engage SWEK to undertake these works for an appropriate fee;
- Sweep roads to maintain a surface free of loose stones and excessive dirt deposits;
- Maintain open drains and drop structures, clean drains that have become excessively silted;
- Clear temporary and permanent stormwater control and erosion control structures of debris and silt on a regular basis and as necessary when filled to 50%;
- Repair all scours, replace topsoil and grassing to areas eroded by stormwater. Upgrade existing erosion control measures or install new temporary or permanent control structures where severe scouring indicates the need:
- Repair all trench subsidence to all infrastructure and services;
- Repaint line marking as necessary;
- Repair or replace all subsided pipes and pavements;
- Replace all construction providing a risk to the public;

At any time during the Maintenance Period, SWEK may undertake random inspections to determine the satisfactory maintenance of the works.

### 3.12.4 Notification of Defects during the Maintenance Period

SWEK will carry out regular audits and inspections of the works during the Maintenance Period. This does not relieve the Developer of this responsibility.



Where SWEK believes that the Developer is not carrying out the necessary inspections and audits during the maintenance period, the SWEK's time in these matters will be charged to the Developer.

Where maintenance requirements or defects are noted, written advice will be issued to the Developer requiring works to be carried out within a stipulated time. Where public safety or health is at risk, verbal advice may be given followed up by written instruction. In this instance appropriate action can be required within 24 hours from the time of the verbal advice.

Where notifications are not complied with by the due date, SWEK can, without further reference, undertake the works at the Developer's cost.

If at any time after the works have been declared Practically Complete, Accepted and placed On Maintenance by SWEK, the works are found to be not in accordance with the approved specification and drawings, then the works are to be rectified at the Developer's expense. Minor items may be monitored and the works undertaken at the end of the Maintenance Period.

### 3.12.5 Construction and Design Defects and Omissions

The repair of construction defects or the rectification of design errors and omissions are to be undertaken as they are identified.

Construction defects include but are not limited to:

- Shrinkages of materials used in construction:
- Incorrect installation of materials; eg, deflection of pipes, incorrect bedding, paths, paving or concrete structures, etc;
- Use of materials that do not comply with the specification: eg, gravels and bedding sands with incorrect gradings, incorrect class of pipes, low concrete strength, etc;
- Defects that were identified during construction, but were monitored rather than rectified.

Any defect occurring because of non compliance with any of the relevant policies laws, codes, specifications and after acceptance of any or all of the constructed works, is to be rectified immediately by the developer at the developer's expense.

### 3.12.6 Non Compliance Reports

The consultant is to submit Non Compliance Reports as part of the As Constructed Documentation referring to the items of construction not in accordance with the approved drawings and specifications.



### 3.13 AS CONSTRUCTED DOCUMENTATION

#### 3.13.1 As Constructed Drawings

The Developer is to provide As Constructed Drawings in hard copy and digital format to the Officer prior to acceptance and On Maintenance.

The following requirements apply:

- **The drawings are to be clearly marked “AS CONSTRUCTED” and certified by a Registered Surveyor as follows:**

“This drawing is an accurate representation of the works as constructed and the information is suitable for use by SWEK and others. As constructed levels have been provided by a Registered Surveyor.....

Certified by .....

- **Earthworks**

Certification of the design plans is sufficient provided adequate As Constructed spot levels are shown adjacent to design level.

- **Roadworks**

- Certification of the design plans is sufficient provided as constructed grade and cross section information and levels is shown adjacent to the design levels and information.
- Location of signage etc is to be confirmed but accurate survey is not required.
- As constructed pavement thicknesses and make-up including minimum CBR values for the pavement materials are to be noted.

- **Stormwater Drainage**

- Certification of the design plans is sufficient provided as constructed pipe diameters and types, invert levels, surface levels, pipe lengths and grades are shown adjacent to the design information.
- The design drainage calculations are to be amended as constructed.

All drawings are to be ed in accordance with SWEK’s mandatory CAD requirements, which are stated in the Appendix K. This is particularly important for As Constructed electronic copies.

The following Australian Standards shall be adhered to:

- AS 1100 Part 101 1992      Technical Drawing – General Principles
- AS 1100 Part 401 1984      Technical Drawing – Engineering Survey and Engineering Survey Design Drawing



### 3.14 OTHER AS CONSTRUCTED DOCUMENTATION

Other As Constructed Documentation shall consist of:

- Statement of Compliance –
- Non Compliance Report(s) –
- Inspection and Testing Results and Reports;
- Other documentation such as:
  - Structural Certification;
  - Certifications by other disciplines and trades.

Inspection and Testing Verification and Records are to include all items required under the agreed and/or approved Inspection and Testing program. As well it will include any other job specific items ordered by the Officer and carried out.

Should any of the above test results not meet the required standards or specification, the Consultant shall include in his submission, details of re-testing and/or rectification carried out.

The documentation is to be presented in logically assembled and bound documents including a table of contents.

#### 3.14.1 Asset Register

SWEK maintains an Asset register in an electronic format.

As part of the process of works being placed “On Maintenance”, the details and value of the works is to be submitted so that it can be placed on SWEK’s Asset Register.

The Consultant is required to provide the necessary details of costs and quantities, broken up into sections segments and allocated to specific sections of roads and drains.

The information is to be recorded on SWEK’s standard Asset Register Forms.



### 3.15 OFF MAINTENANCE

#### 3.15.1 Acceptance of Works Off Maintenance

A written request is to be submitted to SWEK for acceptance of the works Off Maintenance and for the release of the Maintenance Bond at the end of the maintenance period.

This request is to follow a satisfactory Off Maintenance inspection.

The Consultant/Developer is responsible for ensuring that the works are finalised and in such condition that they can be accepted Off Maintenance and taken over by SWEK for future care and maintenance.

#### 3.15.2 Off Maintenance Inspection Checklist

An Off Maintenance inspection will be carried out after submission of the written request. The Off Maintenance Inspection Checklist is to be referred to by the Consultants in their estimation of whether the works are satisfactory to be taken over by SWEK and during the Off Maintenance inspection.

The Checklist is shown in Appendix H and is to be referred to and submitted with any other relevant Off Maintenance information and documentation.

#### 3.15.3 Off Maintenance Certificate

When all requirements and inspections have been complied with, the Officer will issue the Developer with an Off Maintenance certificate.

The certificate will contain the following information:

- Developer's name;
- Development Permit Number;
- Brief Description of the Works;
- Confirmation from SWEK that the whole of the works are satisfactory and from the date stated, SWEK will take over and maintain the works;
- Space for signature and dating by the Officer;
- Space for signature and dating by the developer.

The certificate will have no effect until both the Officer and the Developer have executed the document and the Deed of Agreement is "Signed Off" by both parties.

The original of the Off Maintenance certificate will then be issued to the Developer.

Any Maintenance and other bonds being held will then be returned to the Developer.

- As constructed drawings and any relevant test results or other information requested.
- Asset register forms.



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## 4 DESIGN APPROVAL PROCESS

### 4.1 DESIGN APPROVAL PROCESS

The Developer and/or the Developer's Consultant(s) are advised to discuss the proposed development and work with SWEK throughout the Planning, Design and Construction phases.

The Developer is ultimately responsible for all design and construction activities carried out during the course of the project.

All submissions for approval are coordinated through SWEK's Development Officer.

### 4.2 DESIGN WORKS AND DESIGN REPORTS

Design works required are as shown but not limited to the following:

- Roadworks, drainage, erosion control and associated site works and earthworks;
- Any other associated works required and as required by SWEK.

A Design Report(s) describing the intent, criteria, considerations and philosophy of the design for all works is to be submitted as part of the design documentation for approval. Any departure from SWEK's policies, as set out in the Guidelines, should be noted and justified.

### 4.3 GEOTECHNICAL INVESTIGATION

Prior to the Consultant(s) undertaking the design for the works, the Developer is to organise the appropriately qualified people to carry out a site inspection and investigation to determine the soil types and geotechnical properties of the soils. The level of the investigation is to be determined by the classification of the in situ soils and the particular soil characteristics.

Such information is to form the basis of the design for road and drains and associated works, erosion control, site works and environmental works. A copy of the report is to be forwarded prior to or with the design drawings being lodged for approval.

In certain cases Council may not require a Geotechnical Investigation provided the developer can provide sufficient information regarding existing pavement and or subgrade. This will involve a joint inspection by the Officer and the Consultant/Developer.



## 5 GENERAL ROAD DESIGN REQUIREMENTS

### 5.1 GENERAL

The application of the various standards, codes and principles to road design is intended as a guide in providing minimum standards for the geometric elements of the road.

Of importance to the total development, are factors such as the coordination of vertical and horizontal alignments, fitting the road to the natural contours of the land, preservation of natural features (including vegetation). Also, consideration must be given to practicalities of lot access and safety.

SWEK's Technical Specification and Standard Drawings are to be used by the Developer. Variations from these may be necessary from time to time and these are to be discussed with the Officer and approved prior to detail design work.

### 5.2 DESIGN STANDARDS AND PUBLICATIONS

Road designs should conform to the relevant current Austroads, Australian Road Research Board (ARRB) and other publications that include, but are not limited to:

- **Rural Road Design – A Guide to the Geometric Design of Rural Roads – (Austroads AP G1/03). MANDATORY**
- Guide to Traffic Engineering Practice – All Parts – (Austroads);
- Pavement Design – A Guide to the Structural Design of Road Pavements - (Austroads 2004);
- A Guide to the Design of New Pavements for Light Traffic (APRG Special Report No 21, 1998);
- Sealed Local Roads Manual – Guidelines to Good Practice for the Construction, Maintenance and Rehabilitation of Pavements (ARRB Transport Research Ltd., 2005);

### 5.3 SEALING OF RURAL ROADS

The designation of a proposed road to be sealed or unsealed will be determined by Council. The decision will be made by Council based on the projected traffic volumes, the type of traffic that will use the proposed road and the roads location in respect to the Shire's road network.

### 5.4 DESIGN LIFE

All roads are to be designed to provide a pavement design life of 40 years and the wearing coarse design life of 10 years

### 5.5 SPEED ENVIRONMENT

The Developer is to discuss the Speed Environment for Design of the Road prior to commencing design. The design is to incorporate an assessment of speed environment in the design and provision of speed advisory signs where the speed environment is lower than 100km/hr.





## 6 TRAFFIC MANAGEMENT

### 6.1 GENERAL

Traffic management design is to comply with the following:

- Guide to Traffic Engineering Practice – (Austroads All Parts)
- Turning Path Templates (Austroads)

A traffic environment is to be provided such that the vehicle speeds recommended in the following are not generally exceeded, with due consideration being given to the requirements of various emergency services.

#### 6.1.1 Desirable Design Speeds

The design speed for all rural roads within the Shire is to be 110km/hr unless approved otherwise

#### 6.1.2 Intersections

Intersections, except those being treated with roundabouts or signalisation are to be designed to accommodate road train turning movements and specific attention made to sight distances.

#### 6.1.3 Access to Private Properties

##### **Sealed Road:**

Where a new road is to be sealed the designer is to provide a sealed turnout to entries to private properties.

##### **Drainage:**

All private entries are to have provision of a suitably sized culvert at the entry to ensure entry. Allowance is to be made for major flows over the entry and not onto the proposed road.



## 7 ROAD GEOMETRY

### 7.1 RADII AND GRADIENT

Roads are to be designed to give the best possible grade to suit the natural / existing ground, and minimise the amount of cut and fill.

Design ground levels are to be obtained from actual field survey. The assumption of levels from contour or other types of plans is unacceptable.

General Maximum and minimum grades are as shown below.

		Sealed Roads	Unsealed Roads
Desirable Maximum %		8	6
Absolute Maximum %		10	8
Desirable Minimum %		0.5	0.5
Absolute Minimum %	Straight alignment	0.30	0.60
	Up to 60m radius curve	0.40	0.50
	Less than 60m radius curve	0.75	0.75

The absolute maximum grades may be approved in special cases. Redesign is to be considered where these grades are contemplated and only after complete examination of all options will they be accepted.

Where grades exceed 3% longitudinal grade the designer is to accommodate appropriate drop structures and erosion control devices in the table drain to reduce transportation of silts and sands from the table drain

Lower Absolute minimum grades may be permitted in exceptional cases, the design is to show how the table drain is to drain appropriately and tail-out drain levels are to be shown on the plan

### 7.2 HORIZONTAL CURVES ON ROAD ALIGNMENT

Generally in accordance with the Austroad publication Rural Road Design - 2003.

### 7.3 VERTICAL CURVES

To be simple parabolas and to be used where change of grade exceeds 0.3%.

Generally in accordance with the Austroad publication Rural Road Design – 2003.

The length of all vertical curves are to be in accordance with the relevant Austroads publications and will take into account overtaking and stopping sight distances and comfort factors.

Where the gradient of the intersecting road is 5% or less, consideration may be given to a concrete dished invert across the intersection.



#### 7.4 INTERSECTIONS AND SEPARATION DISTANCES

Adequate stopping sight distance to be provided at all intersections.

Cross roads and “Y” intersections are not acceptable unless signalisation, roundabout or other approved traffic control is warranted and utilised.

All rural access points are to be constructed with a sealed turn out.

#### 7.5 EXTENT OF INTERSECTION CONSTRUCTION

In the instance where the through road is constructed by the developer and the terminating road location is fixed and is to be constructed by another Developer in the future, the former Developer will construct the intersection in full at their expense, including all drainage requirements. This may necessitate construction outside the boundaries of the subject land. In this case all necessary permission is to be obtained prior to the approval of design drawings.



## 8 TYPICAL CROSS SECTIONS

### 8.1 GENERAL

Typical cross sections are to be in accordance with the Standard Drawings.

### 8.2 ROAD WIDTHS

Typical road cross sections are shown on the Standard Drawings and the following road widths will be adhered to:

<b>Residential Roads</b>	<b>Lane Width</b>	<b>Total Shoulder</b>
Minor Road Access < 100 AADT	3.5m (1 x 3.5)	2m
Minor Road < 300 AADT	3.1m (2 x 3.1)	1.5m
Major Rural Road > 500 AADT (Must be Sealed)	3.5m (2 x 3.5) Sealed and Line Marked	1.5m

### 8.3 CROSSFALL AND CONFIGURATION

The cross fall and configuration shall be one of the following:

- 3% cross fall from the centre line for Sealed Roads, 4% for Shoulder ;
- 5% cross fall for unsealed roads and shoulder .

### 8.4 REGULATORY AND TRAFFIC CONTROL SIGNS AND PAVEMENT MARKINGS

All traffic control signs and pavement markings are to conform to the Australian Standards and Guidelines as follows:

- Austroads Guides to Traffic Control Devices;
- AS 1742 – Manual of Uniform Traffic Control Devices.

Suitably presented design plans are to be forwarded to SWEK for Approval.



## 9 ROAD PAVEMENTS & WEARING SURFACES

### 9.1 DESIGN FOR FLEXIBLE PAVEMENTS

The Consultant is to prepare detailed designs for flexible pavements in accordance with the following:

- A Guide to the Design of New Pavements for Light Traffic – (APRG Report No 21)
- Pavement Design – A Guide to the Structural Design of New Pavements – (Austroads)
- Sealed Local Roads Manual - (ARRB)

Notwithstanding anything stated in the design Guidelines, the minimum design life for a pavement in the Shire of Wyndham East Kimberley is 40 years.

The minimum accepted pavement thickness and make-up for rural roads is;

- Subgrade shall be 150mm minimum compacted thickness and compacted to 95% MMDD;
- Subbase and Base courses shall be 150mm minimum compacted thickness and compacted to 98% MMDD and 100% MMDD respectively;
- Wearing surfaces shall be two coat prime and seal wearing coarse (Minimum requirement 14/10 aggregate)

Note: Confirmation from Geotechnical investigation that minimum design is adequate will be required from the Consultant.

### 9.2 PAVEMENT DRAINAGE

The Consultant is to design for pavement drainage where necessary to maintain a moisture free sub-grade and base course as determined by the site geotechnical investigation.

In areas subject to high levels of moisture (adjacent lagoons or low lying areas) the designer should review the need for subsoil drainage. SWEK may require provision of subsoil drainage in certain location on inspection of the subgrade. All works to comply with the following:

- Sub-surface Drainage of Road Structures – (ARRB Special Report no 35).



## 10 STORMWATER DRAINAGE DESIGN

### 10.1 GENERAL REQUIREMENTS

All new roads and the upgrade of existing roads will require the provision of suitable stormwater drainage. This may include the provision of floodways, relief culverts offlet and table drains.

### 10.2 DRAINAGE PHILOSOPHY AND CONSIDERATIONS

SWEK's general stormwater drainage design philosophy is as follows:

- Roadways are to be viewed as primarily for use by vehicular and pedestrian traffic and for providing access to property by vehicle and foot. They are not to be viewed as primary drains and floodways. Public amenity and safety are to be paramount considerations;
- Consideration is to be given to the impact of the proposed drainage system on existing drains and buildings and downstream catchments.
- The drainage system is to be designed to accommodate two different storm events:
  - The initial storm;
  - The major storm.
- Diversion of upstream catchment to independent catchments by the construction of a new road will not be permitted. The designer shall ensure that provision of floodways and culverts is made to ensure catchments are not altered and that no downstream catchment is effected detrimentally.
- Environmental considerations are a major consideration. Erosion and sediment control are required.
- No encumbrance of any land designed, or intended to be utilised as a floodway will be permitted.
- During the wet season, the ground becomes saturated and all drainage design should be carried out with the view that there will be 100% runoff from any and all sites.
- To avoid mosquito breeding, all drainage systems and associated structures should be designed to have no ponding of water.
- Where drainage outlets or outfalls are influenced by tidal action a discharge vs probability analysis is to be undertaken to ensure that the appropriate annual exceedance probability is being catered for.

### 10.3 DESIGN CRITERIA

Stormwater drainage design is to conform with the philosophy, methods and guidelines laid down above and in the following publications:

- Australian Rainfall and Runoff - (IEAust).
- Stormwater Drainage Design in Small Urban Catchments – (ARRB Report No 34 - Argue)
- Sub-surface Drainage of Road Structures – (ARRB Report – Gerke)

As well the following published guidelines are to be consulted:

- Managing Urban Stormwater - Soils and Construction - (NSW Department of Housing)

In addition to the foregoing, the following is to apply for all drainage systems:



- The minimum pipe diameter for a drain picking up surface flow within the road reserve is 375 mm and Class 2 concrete or equivalent is the minimum strength standard.
- Energy losses must be allowed for in drainage lines.
- Stormwater drainage lines in road reserves are generally to be aligned in accordance with the requirements of the services locations and the pit details and pipe laying and subsoil drainage details as set out in the SWEK Standard Drawings.
- Sealed joints are to be used for all drainage lines, ie, external bands or rubber ring type joints.
- The minimum easement width is to be 3.0 m for pipe diameters of 450 mm or less and at depths up to 1.5 m. Increased easement widths are to be provided for pipe diameters and depths greater than above as advised by the Officer.
- Drainage connections to SWEK's system shall be located at the lowest point of each allotment.
- All drainage systems subject to tidal influence shall be marine grade. Concrete structures shall conform to AS3600.

#### 10.4 DRAINAGE RUN-OFF COEFFICIENTS

Due to the variation of land, land use and soil types it is not practical to list Coefficients of Run-off in these Guidelines. The designer is to assess and confirm the coefficients prior to undertaking drainage design for the proposed development. The designer is to treat any and all drainage catchments as being totally saturated.

Runoff coefficients and characteristics for the ultimate development of the allotments based on land zoning must be considered in designing an adequate stormwater system.

#### 10.5 RECURRENCE INTERVALS, TIME OF CONCENTRATION AND RAINFALL INTENSITY

The design intensity for a calculated time of concentration is to be determined from the appropriate Design Rainfall intensity Diagram contained in Australian Rainfall and Run-off.

The minimum time of concentration to be used for a fully developed catchment is 5 minutes.

The designer is to adopt the following minimum Storm Recurrence Intervals of in 5 year for initial events. Major storm events 1 in 20 year

#### 10.6 USE OF ROADS, OPEN SPACE AND DRAINAGE RESERVES FOR RUN-OFF

Stormwater must be contained within the absolute maximum limits tabulated below for the Initial and Major Storms. In all cases the flow is to be contained totally within the road reserve.

	Initial Storm	Major Storm
All Rural Roads	Flow to be either of the following: Contained within a floodway max flow depth 400mm Catered for by underground culver Flow in table drain to be limited to 100mm below base coarse depth	Flow in table drain may spread to road 2.0m within the traffic lane longitudinal flow Floodways depth may exceed 400mm but flow to kept within floodway length

Note: SWEK may request the construction of small bridges as part of the works or in cases where traffic loads or road importance is higher may require provision of higher levels of



service for drainage structures. The developer is encouraged to discuss major drainage crossing with the officer during the design process.

## 10.7 DRAINAGE CATCHMENTS AND NETWORKS

### 10.7.1 Upstream Catchments Passing Through Road

The Consultant is to examine the total drainage catchment and ensure that the drainage system for the road is capable of carrying the ultimate design flow from the upstream catchment.

### 10.7.2 Drainage Outfall

The Developer is to liaise and negotiate outfall requirements with the appropriate authority where the drain discharges into a watercourse, creek, river or the sea.

## 10.8 GROUND WATER AND SUBSOIL DRAINAGE

Much of the available land for roads within the Shire is low lying and susceptible to ground water and tidal influences. Ground water level must be taken into consideration for drainage and all other aspects of design for the road.

Development in these areas may require the importation of fill and the provision of special drainage measures such as sub soil drainage.

Other matters, such as salinity and acid sulfate, must be taken into consideration.

The need for sub soil drainage may not be apparent when construction is carried out in the dry season, however the Developer should be aware that it is required for pavement construction and total pavement maintenance during the wet season.

Any failures resulting from high wet season ground water levels are to be reinstated, together with additional subsoil drainage if required by the Developer at the Developer's expense.

## 10.9 STORMWATER MANAGEMENT, EROSION AND SEDIMENT CONTROL

All drainage systems are to be designed to incorporate water sensitive design principles.

SWEK will not accept any polluted stormwater run-off into its drainage systems. It is therefore essential to thoroughly plan for Stormwater Management and Erosion Control in any proposed road.

A Sediment and Erosion Control Plan together with or incorporating a Stormwater Management Plan is to be provided as part of the civil and landscape design drawings for approval.

## 10.10 DRAINAGE PIPES AND CULVERTS

All drainage pipes and culverts are to be proprietary brand Reinforced Concrete or Fibre Reinforced Concrete of suitable strength and manufacture constructed and tested to Australian Standards. If other types of drainage pipes or culverts are proposed for use, these are to be approved by SWEK.

All drainage pipes and culverts are to be constructed in accordance with the Standard Drawings and Technical Specification.

Particular attention is to be paid to site requirements such as coastal or marine exposure.





### 10.11 DRAINAGE HEADWORKS AND STRUCTURES

All drainage structures are to be constructed in accordance with the Standard Drawings and Technical Specification.

All structures to comply with access requirements for Occupational Health and Safety issues.

### 10.12 SUBMISSION FOR FORMAL APPROVAL

The following drainage design information and calculations are to be submitted for formal design approval:

- Design computations for the initial and major storm event;
- Catchment plan;
- Plan showing the extent of flooding in the major storm;
- Stormwater Management and Erosion and Sediment Control Plan;
- Sub-surface drainage investigation report if it is proposed that sub-soil drains are to be excluded.

### 10.13 OPEN DRAINS

- The maximum velocity of flow is not to exceed 1.0 m/sec in unlined drains and 2.0 m/sec in lined drains.
- Consideration of minor drop structures should be given when table drain grade exceeds 3%.
- Mortared stone pitching or concrete lined channel is to be provided where there is more than 20 degrees change in direction.
- The minimum radius for the above change of direction is 5 m.
- Appropriate safety devices, such as guideposts are to be provided at the road shoulder to protect and advise road users of the presence of the drain.
- All culverts under roads and crossovers and all pipe entries and outfalls are to incorporate standard headwalls.
- Protective works are required at entry and exit from culverts to reduce velocity and guard against erosion.



## 11 DRAWINGS AND DOCUMENTATION

### 11.1 SUBMISSION OF DESIGN DOCUMENTS FOR APPROVAL

Prior to commencement of construction of works the following documentation is to be submitted for assessment and approval. Also refer to Section 2 and the Design Approval Checklist in the Appendices.

Proof of the appointment of a Consultant(s) by the Developer to act on the behalf is required by the Officer prior to commencement of design discussions with the Officer.

The drawings are to be checked and signed by the appropriately qualified person.

#### 11.1.1 Documentation

##### **Documents**

- Proof of appointment of suitably qualified Consultant(s) to act for the Developer;
- Copy of permission to carry out works on Other's land if necessary);
- Copies of approvals to designs from Other Authorities
- Copies of appropriate Public Risk Insurance
- Design Report including Drainage Calculations and Pavement Design calculations;
- Geotechnical and Soil Types Report
- Standard SWEK Specification and Standard Drawings for Civil Works;
- Specification for Stormwater Management and Erosion Control Works;
- Certified Construction Costs for all works with various sections separated out;
- Certifications for any Structural works;
- Any other documentation required.

##### **Plans**

- Copy of Stormwater Management and Erosion Control drawings;
- Copy of Structural Drawings if required, ie, retaining walls, fences, footings;
- Copy of all Civil Design drawings made up as follows:
  - Services;
  - Roadworks Layout, Longitudinal Sections; Typical Cross Sections;
  - Drainage Layout; Longitudinal Sections; Sub Soil Drainage layout
  - Intersection and Details;
  - Typical Sections, General Notes, Locality Plan and General Notes;
  - Signage and line marking
  - Any other relevant drawings.

#### 11.1.2 Numbers of Copies Required

Two copies of all documents only is required if plans are A3 size. If plans are larger than A3 size then three copies minimum of the plans are to be submitted. One copy of drawings in electronic .pdf format.



If, after perusal and comment significant amendments are necessary, then the amended documentation will need to be resubmitted for further assessment and approval.

### 11.1.3 Time for Assessment of Documentation

The Developer / Consultant should allow a reasonable time for examination of the documentation. The Officer will be able to advise of the approximate time required.

A reasonable time for assessing a submission or re-submission of engineering design documents, depending on the size of the submission, is up to twenty working days.

### 11.1.4 Fees and Bonds Required

The following Fees and Bonds are to be submitted prior to approval of plans and prior to the signing of the Deed of Agreement:

- Security Bond;
- External Works Bond if required;
- Design Approval Fee.

### 11.1.5 Deed of Agreement

The Deed of Agreement is to be signed after the plans have been assessed and prior to formal approval of plans.

The Officer will not approve the design documents until the Deed of Agreement has been executed.

## 11.2 DOCUMENTATION STANDARDS

All drawings are to be ed in accordance with SWEK’s mandatory CAD requirements, which are stated in the Appendix K. This is particularly important for As Constructed electronic copies.

The following Australian Standards shall be adhered to:

- AS 1100 Part 101 1992      Technical Drawing – General Principles
- AS 1100 Part 401 1984      Technical Drawing – Engineering Survey and Engineering Survey Design Drawing

The Level Datum must be an established Department of Lands Benchmark to Australian Height Datum. The datum and the locations of such datum points are to be clearly marked on the plans.

## 11.3 PREFERRED DRAWING SCALES

<b>DRAWING</b>	<b>SCALE</b>
Locality Plan	1 : 5000
Site Works, Erosion and Drainage Control Plan	1 : 1000
Overall Layout Plan	1 : 1000
Road Plan	<i>Preferred</i> 1 : 500 <i>Minimum</i> 1 : 1000
Road Longitudinal Section	<i>Horizontal</i> 1 :1000 <i>Vertical</i> 1 : 100

TECHNICAL SPECIFICATION RURAL ROADS  
PART 11 – DRAWING AND DOCUMENTATION



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Road Cross Sections	(If deemed necessary)	1 : 200
Intersections, Traffic Management Devices,		1 : 200
Drainage Plans	(May be incorporated into road plan)	<i>Preferred</i> 1 : 500
		<i>Minimum</i> 1 : 1000
Drainage Longitudinal Sections		<i>Horizontal</i> 1 : 1000
		<i>Vertical</i> 1 : 100

## 11.4 INFORMATION TO BE SHOWN ON DRAWINGS

### 11.4.1 Locality Plan

- Existing Roads;
- New roads;
- All relevant road names;
- Any other significant features.

### 11.4.2 Site Works Plan

- All existing and proposed roads and property boundaries;
- Existing and proposed contours with no more than 0.5m contour intervals;
- Detailed areas of cut and fill;
- Details of existing vegetation and extent of clearing and vegetation protection.

### 11.4.3 Layout Plan

- Existing and new roads with allocated road names (if already approved);
- Pavement widths;
- Lots with lot numbers;
- Existing and proposed drainage and culverts and floodways;
- Services and fence lines (where applicable);
- Traffic management devices;
- Survey and benchmarks and horizontal and vertical datum information.

### 11.4.4 Road Plans

#### **Plans**

Each road shall be drawn in plan and profile and as a minimum typical cross sections are to be provided

- Widths of all pavements, verges and medians;
- Distances (chainages) and stations along centre line of road;
- Horizontal curve data;
- Existing and proposed levels;
- Proposed traffic management devices;
- Existing and proposed services in the road reserve;
- Location of signage;
- Survey and bench marks and horizontal and vertical datum information;

#### **Typical Cross Sections**

To show the offset from the road reserve centre line and level differences

- Road centre line;
- Traffic lane
- Shoulder widths and levels

- Any change in cross fall;
- Road reserve boundary;
- Cuts and fills extending into properties.

#### **Longitudinal Sections**

- Running distance (chainage) along the centre line of the road;
- Existing surface levels along centre line (optional both property lines);
- Design levels for road centre line. Levels at 50m maximum spacing for straight grades and 25m maximum for vertical curves. Levels to be shown at horizontal curve tangent points and other required locations;
- Lengths of grade lines with grades expressed as percentages;
- Intersection and tangent point changes of grade;
- Length of vertical curves and other information;
- Transition and super elevation details.

#### **Intersections,**

- All adjacent lot boundaries;
- Geometric details;
- Design levels at appropriate points;
- Design grades and vertical curve details around curve radials;
- Drainage and other services;

### **11.5 DRAINAGE DRAWINGS**

Where possible, all drainage lines are to show the following detail and are to be drawn in plan and longitudinal section on the same drawing as follows:

#### **Plans**

- Existing and proposed drainage line detailing pipe sizes, types, connections, grades, lengths, drainage structures and special backfill requirements;
- Upstream and downstream levels on all existing drainage and outfalls to which connections are being made;
- Sub soil drainage details;
- Existing and proposed contours / finished levels;
- Open drains, table drains, outlet and overflow structures, head walls retardation and siltation basins etc.

#### **Longitudinal Sections**

- All pipe sizes, grades, type and class of pipe;
- Existing and finished surface levels on the line of the pipe(s);
- The running distances (chainages) between pits and drainage structures;
- Location and level of other services or connections crossing or in close proximity to, including parallel to, the drainage line;

# PART 2

## TECHNICAL SPECIFICATION

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**TECHNICAL SPECIFICATION FOR RURAL ROADS**  
**PART 2 – TECHNICAL SPECIFICATION**

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## MISCELLANEOUS PROVISIONS

### 11.6 INTRODUCTION

This section of the Guidelines has been prepared as the Technical and Material Specification for construction of new roads and upgrading of existing roads within the Shire. These requirements are to be read in conjunction with Parts 1 and 2 of the Guidelines and SWEK's Standard Drawings.

The Technical Specification or Standard Drawings may be used for inclusion in contracts between Developers and Contractors for new works and may also be used for contracts between SWEK and Contractors.

### 11.7 STANDARDS

Conform to the following Standards, Acts and Publications unless specified otherwise:

- AS 1348 Road and traffic engineering - Glossary of terms.
- AS 1742 Manual of Uniform Traffic Control Devices.
- AS 2187.1 Explosives - Storage, Transport and Use - Storage.
- AS 2187.2 Explosives - Storage, Transport and Use - Use of Explosives.
- Mining Act and Mine Safety Control Act (MSCA).
- Work Health Act and Regulations.
- Dangerous Goods Act and Regulations.
- The Water Act

ACA Australian Communications Authority - any Standards, Acts, controls specifically required. Refer to ACA directly.

#### 3.12.2 Standards in Conflict

Where conflict arises between a referenced standard and particular clauses of this specification the specification prevails.

#### 3.12.3 Overseas Standards

Where no Australian Standard exists standards published by the British Standards Institute (BSI) or the American Society for Testing Materials are referenced.

### 11.8 DEFINITIONS

The terms used in this specification are in accordance with the definitions laid down in AS 1348 unless specified otherwise in the Definitions clauses.

- DEVELOPER:** Where the works are not contracted directly by SWEK, the developer is to be the organisation / persons who has approval to undertake the works. Where the SWEK have contracted the works direct to a contractor SWEK may be defined as the Developer
- CONTRACTOR** The person / organisation contracted to undertake the works
- OFFICER** The SWEK representative overseeing the works. In the case of works contracted direct to SWEK the Officer may be the superintendent
- BORROW PIT:** An excavation outside the formation limits for obtaining fill, gravel, rock and rubble.



- DRY DENSITY RATIO:** The percentage ratio of the field dry density of a material to the modified maximum dry density of that material. This property is also termed Relative Compaction.
- NOTICE:** Give the Superintendent sufficient prior notice, in writing, of an action so that that part of the works may be inspected.
- APPROVAL:** Obtain the Superintendent's written approval for that particular part of the works.

## 11.9 ESTABLISHMENT

### 3.12.4 General

Allow in the tender for establishment on site, including, but not necessarily limited to, the following:

- MOBILISATION:** Transportation and establishment on site, of all the requirements to complete the work.
- DEMOBILISATION:** Removal and transportation from site of all temporary and construction facilities and equipment. Restoration of the site, on Practical Completion of the works, compatible with environs.
- ONGOING COSTS:** All indirect costs associated with the contract. Provide, on request, details substantiating the amount shown in the Schedule of Rates.

### 3.12.5 Camp Site/Compound/Workshop - Approval

Approval - Obtain written permission from the owner or lessee of the land.

Pay all costs associated with the use of the site(s).

Maintain all facilities in good condition.

Remove all facilities, unless otherwise agreed in writing with owner or lessee of land, and restore the site to a clean and tidy condition upon completion of the works.

Assume all responsibility for any current and consequential damage caused to the site as a result of occupation.

## 11.10 BORROW PITS AND WATER SOURCES

Borrow pits adjacent to the works will be allowed provided that all the clearances and approvals are obtained. The contractor is advised to contact both SWEK and Main Road WA for existing borrow pits.

### 3.12.6 Extraction Approvals and Clearances – Notice - Approval

#### ***Clearance for Aboriginal Site of Significance / Cultural Sites***

Approval from relevant body is required.

#### ***Approval to Draw Water***

Apply to the Department of Environment for approval to draw water from any surface or sub-surface body, or to the relevant authority (Water Corporation) for approval to draw water from a reticulated supply.

Allow up to 3 weeks for a permit .

Notice; Provide evidence to the Superintendent of the approval to draw water from the appropriate authority.

Approval - Prior to commencing any work on or in borrow pits (new or existing) or using any water sources, provide documented evidence from the following that extraction and other approvals have been obtained:



Service Authorities.

Any other approvals required.

The Principal has neither sought nor obtained and has no control in obtaining the requisite clearances and approvals, and there may be delays in obtaining them. Take all reasonable steps to avoid any delays to the work due to obtaining the requisite clearances and approvals.

#### GENERAL

The Contractor must make all necessary arrangements for the supply and servicing of the required quantities of suitable water for the Works both for construction purposes and for potable water for concrete manufacture, pavement construction and site facilities.

The responsibility for investigating the feasibility and availability of suitable water for the Works from all sources and obtaining the necessary approvals will rest entirely with the Contractor.

Existing stock water points or station water supplies must not be used unless specific approval has been obtained from the current land owner/lessee. Livestock must be allowed unhindered access to pre-existing water points in the vicinity of the Works.

#### WATER BORES

Where the Principal has established a number of water bores in the vicinity of the Works details are provided in contract documents. These bores will be made available for use by the Contractor as possible water sources. All risks associated with the use of such water bores will remain with the Contractor, as the performance of the bores may be affected by seasonal fluctuations and cannot be guaranteed.

The selection of the appropriate pumping equipment to utilise the bores is dependent on the nominal size and class of bore casing used in the development of the bores.

Any test results given are from the only tests carried out. The performance of the bores, quantities available from open water sources and the quality of water cannot therefore be guaranteed and may be subject to seasonal fluctuations.

If drawdown at any water source during the Works is considered excessive, the Superintendent may then direct the Contractor to discontinue the use of the bore or limit the amount of water drawn from the bore. The Contractor must use replacement water from alternative sources at no additional cost to the Principal.

#### 3.12.7 Crushing or Screening - Approval

Apply to the Department of Environment and Conservation for Works Approval and Licence or Registration prior to establishment of any crushing or screening plant that has the production or design capacity of more than 5 000 but less than 50 000 tonnes per year.

#### 3.12.8 Operation and Rehabilitation

##### **Access**

Construct only one access road to each pit.

Confine all transport operations to the access road.

Provide and maintain adequate road drainage.

##### **Extraction**

Strip 100 mm minimum depth top layer throughout the area of operation.

Stockpile stripped material clear of drainage to a maximum height of 2 m.

Side slopes of sand or gravel to be not steeper than one vertical to two horizontal at any time when the excavation is unattended.

By-products of the excavation operations to be removed or buried unless otherwise required.

##### **Limit Of Excavation**

Not within 6 m of any fence line or utility service.



Not within sight of road traffic.

Not within 125 m of any road or railway centre line.

Not within 25 m of a water course.

Maximum area: 1 ha. Align the long side with the contour.

Maximum width: 50 m.

Maximum depth: 2 m.

Leave natural vegetation strips 25 m width between pits.

Stockpile cleared vegetation and subsequently spread over the surface of the extraction area.

Existing pits within 125 m of a public road may be used provided:

No significant revegetation exists.

Extension proceeds away from the road.

Site is rehabilitated after use.

***Progressive Rehabilitation Requirement***

Backfill all test pits.

Respread unused material and rip 1 m deep at 3 m spacing along the contours.

Remove or bury all rubbish and debris.

Replace stockpiled topsoil and cleared vegetation uniformly over the extraction area.

Batter walls at three horizontal to one vertical where excavation is less than 1 m depth, and six horizontal to one vertical where depth exceeds 1 m.

Rehabilitate access road.

**3.12.9 Stream Sites**

Contact the Department of Environment and Conservation prior to conducting any work in a stream site.

***Excavation Limits***

Not within 200 m upstream or downstream of any road structure, pipeline or gauging station.

Not in a manner liable to cause erosion or further disturbance to the watercourse.

Not within 15 m of the trunk of a tree and not under the branches of any tree.

***Conditions***

Leave sizeable island(s) to ensure groupings of trees that will withstand stream bed erosion.

Maximum batter slope: Two horizontal to one vertical.

**3.12.10 Records**

Provide the following details on completion:

List of areas used.

Chainages of area along the public road.

Direction and length of haul road.

Approximate volume of material removed from each site.

Suitable forms for such records will be provided by the Superintendent.

**11.11 EXPLOSIVES**

NO provision of explosive materials is made. The Contractor may wish to make application in writing to the officer for approval to undertake explosive work under exceptional circumstances.





## 11.12 SAFETY

### 3.12.11 Safety Officer - Notice

Notice - Appoint a Safety Officer and notify the Superintendent of the officer's name.

Ensure the Safety Officer is capable and available at all times as required by the Standards.

The Superintendent retains the right to revoke the appointment of the Safety Officer at any time, and direct that another person be appointed.

### 3.12.12 Safety Practice

Provide safety equipment, protective clothing and devices and first aid facilities.

Ensure that employees are instructed concerning hazards and how to avoid injury.

Observe good safety practices throughout the Contract.

### 3.12.13 Safety Helmets

Adhere to the requirements of the Construction Safety Act.

## 11.13 FENCING AND SHORING OF OPEN EXCAVATIONS

Design, construct and maintain the excavation and shoring in a safe and satisfactory condition.

Support trenches in saturated or unstable ground with close timbered shoring or similar.

## 11.14 CONTROL AND SUPERVISION OF WORKS

The Developer / Contractor is ultimately responsible for all construction activities carried out during the course of the project.

Inspections by the Officer shall in no way diminish the responsibility of the Developer to adequately supervise the works.

The Developer / Contractor is to ensure that all works are carried out in accordance with the requirements of the Guidelines, the Deed of Agreement, the approved Inspection and Testing Plan, approved drawings and specifications and as agreed at the Pre-commencement Meeting.

The Developer is to also ensure that a suitably qualified Superintendent carries out the supervision of the works. The Superintendent is to be responsible for certification of the works.

The Contractor, when not personally present on site, is to be represented by a nominated, competent and experienced Supervisor.

Final approval and acceptance will only be given when all works have been executed to the true intent and meaning of the approved drawings and specifications and when all the requirements set out hereafter have been complied with.

The Developer / Contractor shall not commence work without providing the Officer with an executed 'Notice to Commence Works' and a Pre-commencement meeting.

## 11.15 CERTIFICATION OF WORKS

All works will be subject to certification at:

Bonding prior to being accepted On Maintenance;

Off maintenance.

The Consultant is to issue a Statement of Compliance certifying that the works have been constructed in accordance with the intent of the design drawings and specifications.



### 11.16 PRE-COMMENCEMENT MEETING

The Developer or Consultant is to initiate a pre-commencement meeting with the Contractor and the Officer. The Developer, Consultant[s], Contractor, SWEK and Other Authorities (if required) are required to attend to outline all parties' requirements and to discuss the items set out below.

- Engineering, Other plans and Other Authorities approvals;
- SWEK Inspections and Holdpoints;
- Workplace Health and Safety – Safety Management Scheme and General Risk Management;
- Inspection and Testing Plan;
- Traffic control / traffic;
- Spoil off site / import fill;
- Working Hours;
- Environmental - stormwater management, erosion protection, dust and airborne materials control and management of Acid Sulphate soil;
- Reinstatement works to SWEK and other property;
- Protection of and permission to enter private property;
- Design alterations during construction;
- Geotechnical conditions;
- Contractor's Insurances and SWEK indemnities;
- Certifier and Certification of works;
- Other matters.

The meeting is to be minuted by the Officer and copies of minutes distributed to all parties.

### 11.17 NOTICE TO COMMENCE WORKS AND NOTIFICATION OF CONTRACT

Prior to commencing construction, the Developer / Contractor is to give the Officer is to be given at least 24 hours notice in writing which is to include the following information:

- Brief description of Works.
- Developer: Name, Address, Contact Person and Contact Number
- Developer's Representative(s): Firm's name, Discipline; Address; Contact Person and Contact Number
- Contractor; Name, Address, Contact Person and Contact Number
- Date of SWEK Approval of Design
- Proposed Working Hours - All works will be contained between the hours as specified and agreed.

### 11.18 JOINT INSPECTION OF WORKS

With respect to road and drainage and site works, the Officer, Consultant and Contractor are to jointly inspect the site so that agreement is reached on the acceptable standard and method of work. The Consultant (Supervisor) is to be available for that purpose when deemed necessary by the Officer.

In the absence of inspection by the Officer, certification in lieu by the Consultant will not necessarily be accepted.

The Consultant is to ensure that any particular section of work to be inspected has been satisfactorily completed before requesting any such scheduled inspection.

A minimum of 24 hours notice is to be given to enable arrangements to be made for an inspection.



In circumstances where there is concern about workmanship or materials, works are not to proceed until the Officer is satisfied by the adequacy of the work.

If the Superintendent/Contractor is not Quality Assured, then additional inspections may be required at the Officer's discretion.

The Superintendent shall inform the Officer and the Contractor at all Hold Points as specified in the Technical Specification. The Officer may request additional inspections (Hold Points).

### 11.19 HEALTH AND SAFETY REQUIREMENTS

Incorporation of Health and safety requirements into contract documentation should be considered as early as possible in the specification development stage. In general terms, Developer / Contractors are to comply with the following:

- Health and Safety Legislative Requirements;
- Demonstrate evidence of OH&S management and system;
- Provide OH&S Management System details;
- Undertake Risk Assessment;
- Develop Health and Safety Plan;
- OH&S Performance Reporting;
- OH&S Incident Notification.

In the case of contracts between the Developer and Contractor, the Superintendent or the Officer has the right to suspend or terminate the works, if in the Superintendent's / Officer's opinion, the Contractor fails to remedy breaches of health and safety.

In the case of contracts between SWEK and Contractors, the Officer has the right to suspend or terminate the works.

### 11.20 ENVIRONMENTAL CONSIDERATIONS

The Developer / Contractor is to ensure that all reasonable measures are taken in respect of environmental matters as set out in the Design Requirements and Approval Process. In particular the following shall be properly addressed to SWEK's satisfaction.

- The requirements of the relevant Regulations and Acts are to be accorded with;
- The approved plans and specifications, setting out the environmental requirements and measures, are to be strictly adhered to;
- Dust, air and noise emissions are to be controlled such that nuisance is not caused to surrounding properties. SWEK reserves the right to direct any and all such measures as deemed necessary to ensure compliance, including cessation of works. The Developer shall be responsible for all such costs;
- Stormwater quality control, including erosion and sediment control, is to be totally implemented in accordance with the approved Erosion Control and Stormwater Management Plan;
- The Environmental Bond lodged with the drawing approval may be drawn on and implemented if necessary. In the case of a contract between a Developer and a Contractor SWEK will draw on the Developers Bond, it is the responsibility of the Developer to ensure the Contractor undertakes the works in an appropriate manner.

### 11.21 PROTECTION OF SURVEY MARKS

The Contractor is to ensure that the contract surveyor has researched and located all reference marks within the vicinity of the works. Reference mark's include State Survey Marks (SSM's) or Bench Marks (BMs), Road Reference Marks (RRM's) and Cadastral Survey Marks (CSM's).



Each mark site will be either painted, or the Cadastral Survey (CSM) position offset. Give five days notice of intention to dig in a particular road reserve.

The Contractor should be aware the destruction of Survey marks is an offence under section 62 of the Licensed Surveyors Act.

## 11.22 SALT WATER ENVIRONMENTS

The Developer / Contractor shall be diligent in design and construction of all roads, drainage, and associated structures in salt environments.

Consideration should be given to the use of Potable / Salt water in the preparation of all concrete and mortar mixes, spray seals and road pavements.

The Contractor shall ensure the total soluble salts content is less than 3,000 mg/litre (total dissolved salts for use in construction) and shall provide evidence of construction water salt contents.

## 11.23 MAJOR DEPARTURES FROM DESIGN INTENT – NON-COMPLIANCE REPORTS

Notwithstanding the most diligent efforts of the Contractor, Consultant and Officer to comply with the intent of the approved drawings and specification, some non-complying construction works may occur.

As well, proposed major departures of design intent may occur during construction. These are to be approved by SWEK in writing before construction.

Non-compliances are to be reported to SWEK through submission of Non-Compliance Reports.

These reports shall identify the nature and number of non-complying items and state the Consultant's justifications for SWEK acceptance.

## 11.24 ENVIRONMENTAL, EROSION AND STORMWATER MANAGEMENT CONTROLS

### 3.12.14 Introduction

The work to be executed under this part of the Section is the implementation and construction of measures to control erosion and sedimentation. These works may be temporary or permanent.

Degradation of land associated with land development can occur as a result of erosion by water and wind, salinity and Acid Sulphate Soils. All aspects of land degradation are to be addressed by the Developer / Consultant in the preparation of the erosion control and stormwater management plan.

The Developer is to plan and carry out the whole works to avoid erosion and sedimentation of the site, surrounding country, watercourses, water bodies and wetlands.

The approved design plan may have to be modified due to site or weather conditions during the construction of the works.

The contractor is to undertake the construction and maintenance of soil and water management in accordance with the approved drawings and requirements set out herein.

The Developer / Contractor has a duty of care towards erosion and sedimentation control. Necessary works, even if not specified, are to be carried out.

### 3.12.15 Contractors Responsibilities

The Contractor is to adhere to the requirements set out in the approved Erosion Control and Stormwater Management Plan, unless the Officer considers such measures are to be amended. Continual reappraisal of the site is absolutely necessary and the Contractor must ensure that effective erosion and sediment control is provided at all times.

The Contractor is not to commence any clearing or excavation without implementing the appropriate soil and water / dust management controls.

Transport of soils, earth, sand, loose debris etc to or from the development site will be in a manner that prevents the dropping of such material on surrounding streets. The Contractor must ensure that the wheels, tracks and body surfaces of all plant and vehicles leaving the site are free of mud etc.

## TECHNICAL SPECIFICATION FOR RURAL ROADS MISCELLANEOUS PROVISIONS

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The Contractor is to provide and maintain slopes, crowns and drains on all excavations and embankments to ensure satisfactory drainage at all times. Water is not to pond on the works unless such ponding is part of the approved Sediment and Erosion Control Plan, or if directed.

The cost of installation, maintenance, inspection, removal and restoration of affected areas must be borne by the Developer.

The Contractor is to restore any damage caused directly or indirectly by the development of the works to the original condition at no cost to SWEK. Such works will also include the clearing of material from roads, pipes, drains and gutters. Any material removed from drains, gutters and the like will be disposed of to an approved site.

The development is to be staged as shown on the approved plans so that re-vegetation of land can commence quickly.

The Contractor is to maintain all sediment and erosion control structures throughout the whole development period, including the maintenance period. All works to be as required to maintain efficient operation or as directed by the Consultant / Officer.

## PROVISION FOR TRAFFIC

### 11.25 STANDARDS

Conform to the following Standards and Publications unless specified otherwise:

- AS 1348 Road and Traffic Engineering – Glossary of Terms
- AS 1742.3 Manual of Uniform Traffic Control Devices - Traffic Control Devices for Works on Roads.
- AS/NZS 4360 Risk Management
- AS/NZS 4801 Occupational Health and Safety Management Systems
- AS/NZS 3845 Road safety barrier systems

CODE OF PRACTISE Traffic Management for Works on Roads

AUSTROADS Guide to the Geometric Design of Rural Roads.

AUSTROADS Bridge Design Code.

### 11.26 GENERAL

Minimise obstruction and inconvenience to the public.

Assume responsibility for the safe conduct of traffic through or around the works, 24 hours a day, from possession of the site to completion of all works.

#### 3.12.16 Traffic Lanes

Maintain at least 1 lanes open to traffic at all times.

Program work so that the closure of turning lanes is minimised.

### 11.27 TRAFFIC MANAGEMENT PLAN - NOTICE

Notice - Submit the Traffic Management Plan to the Superintendent a minimum of 2 working days before the commencement of work.

The Traffic Management Plan must be designed, modified and supervised by persons who have passed a nationally accredited course for Traffic Management at work sites.

Design the Traffic Management Plan in accordance with AS 1742, Manual of Uniform Traffic Control Devices Part 3: Traffic Control Devices for Works on Roads. Produce the plan by electronic means, eg. Computer Aided ing (CAD) and submit the plan to the Superintendent via electronic means, eg. E-mail, computer disc etc.

Include the following details on the Traffic Management Plan:

The name of the Traffic Management Plan designer.

The name of the Traffic Management Plan supervisor.

The registration number and expiry date of the Traffic Management Plan designer's and supervisor's accreditation.

Address all of the issues relevant to traffic conditions at the work site. The Superintendent reserves the right to request modifications to the plan during the works.

As a minimum address the following issues:

Emergency vehicle access.

The work zone speed limit.

Restrictions to existing lane use.

Changes to existing lane use.  
Works being carried out under traffic.  
The need for detours (To be discussed with SWEK).  
Night work and work site illumination.  
Separation of traffic and work areas.  
Sign spacing.  
Advance warning of the works.

### **3.12.17 Traffic Management Plan Audits**

Inspecting Officers from the SWEK will perform random audits of traffic management at work sites as part of their daily routine duties.

These audits will include assessment of the Traffic Management Plan in progress and observation of the routine daily tasks and record keeping for traffic control at the work site, including modifications to the Traffic Management Plan.

If traffic control is not being carried out in accordance with the Traffic Management Plan or the Inspecting Officer deems modifications to the Plan necessary, the Superintendent will arrange for corrections to be carried out immediately.

## **11.28 WARNING DEVICES**

Take care when placing warning signs, work signs, traffic management devices, or plant and equipment within the road reserve to ensure that these do not interfere or restrict sight lines, particularly at intersections, or are obscured by trees.

Road work signs should reflect the current conditions of the site. Australian Standard AS 1742, Part 3 provides guidance on appropriate use of these signs.

### **3.12.18 Works in Progress Signs**

Whilst works are in progress display signs, sized 1200 x 900mm with 100mm high black helvetica medium lettering on a white background displaying the following details:

The Contractor's business name.

The Contractor's business phone number.

The Contractor's after hours phone number.

Display these signs prominently at the extremities of all works in progress and in addition to the work signs requirement. They will remain the Contractor's property.

### **3.12.19 Star pickets**

Do not use star pickets for support of road work signs. Issues of sign stability can be addressed by prudent use of sand bags. Do not use star pickets or items such as steel drums for delineation purposes within 5m of the edge of the traffic lane. Bollards and flagging are appropriate alternatives. Star pickets may be used for fencing support within the work site, provided appropriate action is taken to reduce any associated hazard for workers within the site.

### **3.12.20 Non standard signs**

Obtain specific approval from the Superintendent before using signs not included in the current Australian Standard for Traffic Control Devices for works on roads.

### **3.12.21 Work Zone Speed Limits**

Where work zone speed limits are approved by the Superintendent, erect speed limit signs on "Oz-Post Spike" poles installed in accordance with the manufacturer's recommendations. Position the signs to the locations and heights nominated in AS 1742.3 clause 2.5.2.

Submit proposals to alter speed limits to the Superintendent 2 working days prior to the erection of signs, for approval under the Control of Roads Act.

Design the Traffic Management Plan so that speed limits lower than the following absolute limits are not required;

Urban or built up areas.	40 km/h
Bridge works, when restricting traffic to one lane and only in conjunction with a stop-traffic situation. A safety barrier complying with Test Level 0 of AS/NZS 3845 must also be used.	40 km/h
All other rural works.	60 km/h

### 3.12.22 Safety Barriers

Where safety barriers are to be used ensure that they comply with the relevant work zone speed limit proposed in the Traffic Management Plan.

## 11.29 TRAFFIC CONTROL

Carry out the works using traffic control as defined by the Traffic Management Plan under the supervision of an accredited Traffic Management Controller.

Modify the Traffic Management Plan during the works to suit site conditions if required or requested by the Superintendent. The Superintendent must endorse all changes to the Traffic Management Plan.

If an incident occurs within, on approach to or departure from the work site a photographic record of the traffic control should be made as soon as practical and all incidents should be reported in line with the requirements of AS/NZS 4801 Occupational Health and Safety Management Systems.

Single lane operation of two-way traffic will only be permitted when traffic is directed by traffic controllers, signs or portable traffic signals, dependant on the site conditions.

Organise police control as required, or as requested by the Western Australian Police.

## 11.30 DETOURS

Determine with SWEK if Detours are required.

### 3.12.23 Construction

Provide detours when it is impractical to provide for traffic on the existing road system.

Design and construct detours to comply with AUSTRROADS "Guide to the Geometric Design of Rural Roads" and the following minimum standards:

	NATIONAL HIGHWAY	SECONDARY HIGHWAY	LOCAL ROAD
Carriageway Width	10 m	8 m	6 m
Design Speed	80 km/h	60 km/h	40 km/h
Horizontal Curve radius with 3% superelevation	250 m	150 m	50 m
Vertical Curve radius (crest)	2,500 m	1,000 m	400 m
Vertical Curve radius (sag)	1,000 m	600 m	400 m
Pavement Width	8 m	6 m	4 m
Gravel Pavement Thickness (when specified)	150 mm	100 mm	50 mm
Lateral Clearance to Obstruction (from edge of carriageway)	2.5 m	1.2 m	1.0 m

Signs/Warning Devices: As in Traffic Control Plan.

Guideposts: At all fills, curves and crests.

Flood Gauge Posts: At all floodways.



Total Length at any one time: 5 km max.

Construct detours with a finished surface level crown height 250 mm above the natural surface.

Compact top 150 mm to 95% relative compaction.

Match detours neatly to the existing road system.

Provide sufficient resources to direct and assist traffic, when detours become restricted.

Carry out immediate remedial works when traffic is delayed by poor detour conditions or surface condition is dangerous.

Provide and maintain adequate drainage.

### **3.12.24 Maintenance**

Maintain the existing road network, and all detours, in use by the public.

Unsealed Surfaces: Regrade and roll to maintain a comfortable riding quality at design speed.

Prevent dust nuisance by water spraying at regular intervals to keep surface moist.

Do not use waste oil as a dust suppressant.

Remove debris and rubbish.

Maintain road signs and guide posts in a clean state.

## **11.31 ACCESS TO ADJACENT PROPERTIES AND SIDE ROADS**

Maintain access to adjacent properties and side roads at all times to a level appropriate for the type and frequency of traffic.

Provide and erect signs detailing alternative access.

Ensure adequate access is maintained for pedestrians and cyclists as required, including delineated access if paths are closed.

## **11.32 CONTRACTOR'S PLANT AND EQUIPMENT**

Provide public traffic right of way at all times unless traffic control is in use.

Keep parking and materials storage clear of trafficked areas.

Do not leave equipment or tools unattended as a hazard to the public.

Floodlight the road and area within 50 m of the site when working at night, to a ground level illuminance of 10 lux minimum.

### **3.12.25 Rotating Beacons on Plant**

Provide a rotating yellow beacon on the roof of all plant and equipment, fitted with a minimum 55 watt globe or equivalent strobe light.

Ensure that the light is operational whenever the plant or equipment is working on the roadway.

Ensure that the light is visible from all approaches and not obscured by exhaust stacks, back hoe arms etc., or covered in dust.

Protect the lights from damage by scrub etc.

Fit service vehicles with vehicle mounted warning devices in accordance with AS 1742.3.

## **11.33 RESTORATION**

Upon completion of works:

Remove all temporary warning devices and traffic control measures.

Remove all temporary works and detours and reinstate the areas to reflect their natural state, including removal and disposal of seal and dragging windrows and debris back across the detour carriageway.

Reinstate permanent traffic control devices temporarily removed during the works.

#### 11.34 CLEARING AND GRUBBING

SPECIFICATION REFERENCE; Refer to the Environmental clauses in the Miscellaneous Section.

BURNING; Do not light fires or burn any demolished material or vegetation either on or off the site.

#### 11.35 CLEARING

DEMOLITION; Remove fencing, buildings, kerbing, debris, drainage structures, old road surfaces and other structures as required.

REMOVAL; Except for materials to be salvaged and retained by the Superintendent take possession of demolished materials and remove them from the site.

SALVAGED ITEMS; >

EXTENT; Clear the site only to the extent shown on the drawings and specified in this section.

ACCESS; Allow 3 metre wide cleared access ways around proposed culverts, gravel pits and stockpiles.

EXCESS CLEARING; Where excess clearing has taken place beyond that specified or shown on the drawings pay compensation for the damage and rehabilitate the areas in accordance with the Reinstatement clause.

COMPENSATION; Pay compensation (To be charged as a negative variation to the Contract) for excess clearing at the rate of \$10 per square metre. The minimum undertaking applicable to any particular occurrence of damage shall be \$5, 000.00.

#### 11.36 TREES TO BE RETAINED

Retain selected trees shown on the drawings or as directed.

PROTECTION; Protect from damage, trees which are required to be retained. Do not remove topsoil from the areas within the dripline of the trees and keep the area free of construction equipment and materials.

DAMAGE; If a tree, which is marked to be retained, is damaged and repair work is considered impractical, or is attempted and fails, remove the tree and the root system, if so directed. Replace the tree with a tree of the same species and similar condition and size or pay compensation.

Compensation for damage to existing vegetation shall be borne by the Contractor as a negative variation to the Contract and determined as follows:

Tree valuation rate: \$10 per cm of tree circumference at a height 1 m above the ground.

Maximum valuation: \$2500 per tree

Minimum valuation: \$250 per tree

#### 11.37 MULCHING

GENERAL; Mulch all cleared vegetative matter in mechanical brush chippers to a maximum size of 100mm as the clearing work proceeds. Do not stockpile cleared material for later mulching.

STUMPS; Stumps and other material unsuitable for mulching may be buried in disused gravel pits during rehabilitation of the pits.

GRASSES; Do not mulch grass clods, roots or other components containing viable propagules. This material may be buried in disused gravel pits.

STOCKPILES; Stockpile mulched material on the site at a maximum height of 2m for use during reinstatement work.

RURAL AREAS; Stockpile mulch on the site for reuse and power blow surplus mulch into the adjacent natural vegetated areas adjacent to the works.

### 11.38 STRIPPING OF TOP LAYER

EXTENT; Strip the top layer of natural material to a depth of 100 mm, for the full formation width.

Stockpile stripped material at sites within 1 km of the point of origin. Stockpile heights not to exceed 2.0 m.

Replace stripped material in fill with standard fill material compacted to at least 90% relative compaction.

Spread stripped material on areas to be landscaped and/or on road batters, following completion of earthworks.

### 11.39 GRUBBING

Grub out and remove from the site all vegetation to a depth of 200mm below subgrade surface in cut and 200mm below natural surface under fills.

Fill grub holes and other excavations as required with standard fill material compacted to the density of the surrounding soil.

### 11.40 REINSTATEMENT

Reinstate any clearing undertaken during the contract to rehabilitate the area back consistent with its untouched surrounds. This includes seeding, planting, watering or other measures necessary to rehabilitate the area.

MULCH; Spread mulched material over the rehabilitated area, including batters and verges, to a uniform cover of 50mm thickness.

DETOURS; Where detours are specified in the Provision For Traffic section or otherwise agreed to, rehabilitate the detour areas in accordance with the requirements of this section.

### 11.41 CLEANING UP

Remove all excess fill, rubble and other debris from the site.



## EARTHWORKS

### 11.42 STANDARDS

The work to be executed under this Specification consists of the stripping and stockpiling of topsoil, supply of specified materials, excavation, removal of specified materials to spoil, filling, compaction, construction, trimming and respread of topsoil, all to the profiles, levels and surface finishes as specified or as shown in the Drawings.

Conform to the following Standard and Publication unless specified otherwise:

AS 1289	Methods of Testing Soils for Engineering Purposes.
AS 2187	Parts 1 and 2 - Rules of Storage, Transport and Use of Explosives
AS 2188	Explosives – Relocatable Magazines for Storage.
MRS 67-08-43	Main Roads Western Australia Survey and Mapping Standard 67-08-43 "Digital Ground Survey"
MRS 67-08-90	Main Roads Western Australia Survey and Mapping Standard 67-08-90 "Earthwork Volume Calculations"

Road Note 8 Engineering Road Note 8 "Statistically Based Quality Control for Density in Road Construction" (October 2003)

### 11.43 EARTHWORKS IN CUT

#### 3.12.26 Description

Operations necessary for excavation, irrespective of the type of material and subsurface conditions, including:

Working cuts so that material meeting standard fill requirements is used for the subgrade;

- compaction of material below the subgrade surface; and
- shaping and trimming of formation.
- disposal of excess excavated material;

#### 3.12.27 Excess Material

Haul and dump and spread excess material:

To spoil dump sites specified.

Clear site of organic material/topsoil prior to stockpiling material.

#### 3.12.28 Rock in Subgrade - Approval

In the event that rock is encountered in the Subgrade the contractor shall:

- Approval - Obtain agreement from the Superintendent to the extent of the excavation.
- Excavate rock encountered in the subgrade.
- Avoid forming pockets of shattered material below the level of the excavation.
- Remove all loose material.
- Trim the excavation to shed water.
- Replace excavated material with select fill compacted to 95 per cent relative compaction.



### 3.12.29 Unsuitable Material Below Subgrade Surface other than Rock - Approval

In the event that unsuitable material is encountered below the subgrade level the contractor shall:

- **Approval** - Obtain directions from the Superintendent before works commence.
- Excavate subgrade material which does not conform to the properties of standard fill as specified.
- Dry out material with excessive moisture content to achieve a moisture content which permits specified compaction.
- Replace excavated material with standard fill compacted to 90% relative compaction.

### 3.12.30 Blasting

Under normal circumstances blasting will not be allowed. When it is deemed that excavation in rock or hard soil may be carried out by blasting, a blasting permit is to be obtained from the appropriate authority and written approval by SWEK, detailed evidence of the need to undertake blasting will be required.

All explosives are to be stored and handled in accordance with the requirements of the Mines Regulation Act 1946, the Explosives and Dangerous Goods Act 1961, AS 2187: Explosives – Storage, Transport and Use and AS 2188: Explosives – Relocatable Magazines for Storage.

Blasting shall only be carried out by a suitably experienced and qualified person. The shot firer shall be responsible for the repair of damage, legal liability or anything that may arise from the blasting operations. Appropriate screens, shields and matting necessary to prevent rock, stones, earth, debris or other material from scattering or blowing from the immediate site of blasting shall be provided as necessary.

## 11.44 EARTHWORKS IN FILL

### 3.12.31 Description

Earthworks in fill includes winning, hauling, placing and compacting material on all prepared areas including holes, pits and other depressions.

### 3.12.32 Preparation Prior to Filling

Subsequent to stripping of topsoil, apply a minimum of three passes with maximum mass compaction equipment.

### 3.12.33 Unsuitable Material Beneath Fill - Approval

In the event that unsuitable material is found beneath fill placement zone the contractor shall:

- **Approval** - Obtain directions from the Superintendent before works commence.
- Remove unsuitable foundation material as directed before the fill is placed.
- Replace excavated material with standard fill compacted to 90% relative compaction.

### 3.12.34 Construction Method

Fill by the "Compacted Layer" method.

Select appropriate method(s).

#### **Compacted Layer Method**

Use where material generally does not contain cobbles, boulders or broken rock.

Deposit and spread the material in uniform level layers to a maximum thickness of 250 mm loose measurement for the full width of fill.

Compact each layer to the specified compaction (refer Table - Dry Density Ratios for Conformance) before placing the next layer.

Use standard fill for the subgrade.



## 11.45 FILL MATERIAL

### 3.12.35 General Fill

Use the best locally available material.

Use fill material, whether cut or borrow, that is free of organic matter and has a minimum soaked CBR at 90% MMDD of 10%, at 2.5 mm penetration, and a plasticity index between 2% and 15%.

### 3.12.36 Standard Fill

Conform to the following properties:

CBR 4 day soaked at 95% MMDD at 2.5 mm penetration: 15 minimum

Maximum Particle Size: 100 mm

Plasticity Index: 2%-15%

### 3.12.37 Select Fill

Select fill shall be comprised of gravel, decomposed rock or broken rock, free from organic matter and lumps of clay.

Conform to the following:

#### GRADING

AS SIEVE (mm)	% PASSING (DRY WEIGHT)
37.50	100
19.0	80 - 100
9.5	60 - 100
4.75	45 - 100
2.36	30 - 100
1.18	20 - 100
0.425	5 - 100
0.150	3 - 30
0.075	1 - 10

#### **Properties**

CBR, 4 day soaked at 95% MMDD at 2.5 mm penetration: 30 minimum.

Plasticity Index: 2 - 15% maximum.

Linear Shrinkage: 2 - 6%.

### 3.12.38 Sand Clay Fill

Sand clay (clayey sand) may be used as an alternative to Select Fill.

Conform to the following:

#### GRADING

AS SIEVE (MM)	% PASSING (DRY WEIGHT)
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4.75	100
2.36	70 - 100
1.18	50 - 79
0.60	36 - 63
0.425	30 - 56
0.30	25 - 50
0.15	18 - 40
0.075	14 - 28
0.0135	5 - 15

### **Properties**

CBR, 4 day soaked and 95% MMDD at 2.5 mm penetration:	30 minimum.
Plasticity Index:	15% maximum.
Linear Shrinkage:	1 - 8%.

### **11.46 PREPARATION AND MAINTENANCE OF SUBGRADE SURFACE**

Trim surface to the compliance tolerances specified free of depressions and free draining.  
Maintain and repair any damage to the prepared surface prior to placing further material.

### **11.47 WIDENING OF EXISTING FORMATION**

Cut back the existing formation and pavement as shown on the drawings by not less than 150 mm on each edge to sound densely compacted material to form a uniform edge (curved or straight where applicable). The Contractor shall mark the alignment of the cut by painting spots on the existing seal, not exceeding 50mm in width at intervals of not greater than 3 metres.

Construct the widening by cutting and filling as specified.

### **11.48 TRIM AND COMPACT UNPAVED AREAS**

Shape, grade and compact as specified.

### **11.49 SURFACE FORMATION**

#### **3.12.39 General**

Form the road generally with material cut from the table drains, in accordance with the typical cross section.

Allow for construction to the specified height above natural surface, either by local widening of table drains or importation of standard fill.

### **11.50 CONFORMANCE - NOTICE**

#### **3.12.40 Existing Surface Levels**

Notice - Obtain inspections of any disputed existing surface levels with the Superintendent prior to any stripping or earthworks operations.

#### **3.12.41 Tolerances**

Finish earthworks to a smooth compacted and uniform surface within the following limits:

Formation Width:	Not less than specified.
Subgrade Surface:	Maximum 25 mm below and not above specified level.



Unpaved Areas/ Table Drain Invert:	Maximum 75 mm above or below specified level, free of depressions capable of ponding water. Maximum 40 mm adjacent to kerbs.
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### 3.12.42 Proof Rolling - Notice - Approval

Proof roll all areas and obtain satisfactory results before ordering conformance testing of those areas.

Notice; Give the Superintendent not less than 24 hours notice of the location and commencement time for the proof rolling.

Plant Requirements; use plant in proof rolling procedures that comply with the following requirements:

- Static smooth wheeled rollers with a mass of not less than 12 tonnes and a load intensity under either the front or rear wheels of not less than 6 tonnes per metre width of wheel.
- Pneumatic tyred plant with a mass of not less than 20 tonnes and with a ground contact pressure under either the front or rear wheels of not less than 450 kPa per tyre and a ground contact area of not less than .035 sq.m. per tyre.

Check areas for level tolerance and layer thickness before proof rolling.

Proof roll each layer immediately following completion of compaction. If proof rolling is carried out at a later time, water the surface and roll with the test roller prior to commencement of proof rolling.

Compliance; the proof rolling requirements are deemed to comply when an area withstands proof rolling without visible deformation or springing.

Remedial work; remove and reconstruct areas that deform or break up.

### 3.12.43 Conformance Testing – Approval

Refer to the CONFORMANCE TESTING section for testing requirements.

#### **General Fill**

Conformance testing will be carried out on each layer of fill.

#### **Subgrade**

Subgrade surface will be tested only when it is within level tolerance and conforms to proof rolling.

Check subgrade surface levels prior to testing.

Approval – obtain the Superintendent's approval of subgrade conformance prior to placing further material.





## CONFORMANCE TESTING

### 11.51 GENERAL

**This section is to apply only at the discretion of the Officer.**

The Contractor will be responsible for all conformance testing required under the contract and the specification listed herein.

### 11.52 STANDARDS

AS 1141	Methods for testing and sampling aggregates.
AS 1141.11	Particle Size Distribution by sieving.
AS 1141.14	Particle Shape by Proportional Calliper.
AS1141.18	Crushed Particles.
AS 1141.15	Flakiness Index.
AS 1141.20	Average Least Dimension of Aggregate by Direct Measurement.
AS 1141.23	Los Angeles Value.
AS 1141.24	Sodium Sulphate Soundness.
AS 1141.40	Polished Aggregate Friction Value-Vertical Road-Wheel Machine.
AS 1141.41	Polished Aggregate Friction Value-Horizontal Bed Machine.
AS 1289	Methods of testing soils for engineering purposes.
AS 1289.3.1.1	Liquid Limit.
AS 1289.3.4.1	Linear Shrinkage.
AS 1289.3.6.1	Particle Size Distribution.
AS1289.5.2.1	Determination of the dry density/moisture content relation of a soil using modified compactive effort.
AS 1289.5.8.1	Determination of field density and field moisture content of a soil using a nuclear surface moisture-density gauge-Direct transmission mode.
AS 1289.6.1.1	California Bearing Ratio.
MRWATM	Main Roads Western Australia, Test Methods

### 11.53 SPECIFIC TESTS

Conduct CBR moulding using a compaction hammer conforming with the requirements of AS 1289. Where tests are required which are not included in the manual use the appropriate Australian Standard.

### 11.54 NOTICE OF TESTING – NOTICE

Notice: - Provide the contractor with full details of proposed testing contractor prior to commencement of construction.

Notice - Provide the Superintendent with a copy of the order for testing simultaneously with the order being sent to the nominated testing contractor.

Provide the Superintendent with the results of process control testing as identified in the relevant ITP with all requests for conformance testing.

Notice - Notify the Superintendent prior to any rework of failed lots.

### 11.55 TABLE - TEST FREQUENCIES, COMPLIANCE TESTING

Test frequencies will be as follows:

**Table – Test Frequencies for Bitumen Spray Sealing**

TYPE OF TEST	CUT BACK BITUMEN / PRIME	POLYMER MODIFIED BINDER
Dynamic Viscosity (60°C)	1 per 8,000L	-

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Consistency (45 <sup>0</sup> C)	-	1 per 12,000L
Elastic Recovery at 45 <sup>0</sup> C	-	1 per 12,000L
Torsional Recovery at 25 <sup>0</sup> C	-	1 per 12,000L

Table - Test Frequencies For Soils

\* run = 1 pass of cement spreader.

TYPE OF TEST	GENERAL FILL	STANDARD FILL	SELECT FILL/SAND CLAY FILL	SUBGRADE	SUB-BASE	BASECOURSE	BRIDGE BACKFILL USING STD. FILL	BRIDGE BACKFILL USING SELECT FILL	CULVERT BACKFILL USING STD.FILL	CULVERT BACKFILL USING SELECT FILL
Field Density (FDD) by WA 134.1 and AS 1289.5.8.1	1 in 3,000 m <sup>2</sup> (min. of 3 tests per lot)	1 in 3,000 m <sup>2</sup> (min. of 3 tests per lot)	1 in 3,000m <sup>2</sup> (min. of 3 tests per lot)	1 in 1,000 m <sup>2</sup> (min. of 3 tests per lot)	1 in 1,000 m <sup>2</sup> (min. of 5 tests per lot)	1 in 1,000 m <sup>2</sup> (min. of 5 tests per lot)	2 tests per lot	2 tests per lot	1 tests per lot	1 tests per lot
Modified Compaction (MMDD) by AS 1289.5.2.1	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD
Particle Size Distribution by AS 1289.3.6.1	-	-	1 per lot	-	1 test per lot	1 test per lot	1 test per lot-	1 test per lot	1 test per lot-	1 test per lot
Plasticity Index by AS 1289.3.1.1, 3.2.1, 3.3.1	-	1 per 5 lots	1 per lot	-why???	1 test per 5 lots	1 test per 5 lots	-	-	-	-
Linear Shrinkage by AS 1289.3.4.1	-	1 per lot	1 per lot	-why???	1 test per lot	1 test per lot	-	-	-	-
California Bearing Ratio by AS 1289.6.1.1	1 per 10 lots	1 per 10 lots	1 per each 2,000 m3	-why???	1 test per 10 lots	1 test per 10 lots)	-	-	-	-
Layer Thickness by WA 330.1	-	-	-	-	-	1 per FDD	-	-	-	-
Ball Embedment by WA 312.1	-	-	-	-	-	1 in 5,000 m2	-	-	-	-

TECHNICAL SPECIFICATION FOR RURAL ROADS  
CONFORMANCE TESTING



TYPE OF TEST	GENERAL FILL	STANDARD FILL	SELECT FILL/SAND CLAY FILL	SUBGRADE	SUB-BASE	BASECOURSE	BRIDGE BACKFILL USING STD. FILL	BRIDGE BACKFILL USING SELECT FILL	CULVERT BACKFILL USING STD.FILL	CULVERT BACKFILL USING SELECT FILL
Pavement Degree of Saturation prior to Sealing by AS 1289	-	-	-	-	-	1 in 5,000 m2	-	-	-	-
	-	-	-	1 per run	1 per run	1 per run	-	-	-	-
	-	-	-	1 per 1000m2 with a min. of 3 tests	1 per 1000m2 with a min. of 3 tests	1 per 1000m2 with a min. of 3 tests	-	-	-	-
	-	-	-	1 per 1000m2 with a min. of 3 tests	1 per 1000m2 with a min. of 3 tests	1 per 1000m2 with a min. of 3 tests	-	-	-	-
	-	-	-	-	-	1 per water source	-	-	-	-



Table - Test Frequencies For Aggregates And Pavement Surfaces

TYPE OF TEST	AGGREGATE	PAVEMENT MARKING	PAVEMENT SURFACE
Particle Size Distribution by AS 1141.11	1 in 250 t	-	-
Los Angeles Abrasion Value by AS 1141.23	1 in 250 t	-	-
Particle Shape by AS 1141.14 at 2:1 ratio	1 in 250 t	-	-
Flakiness Index by AS 1141.15	1 in 250 t	-	-
Average Least Dimension by AS 1141.20	1 in 250 t	-	-
Sulphate Soundness by AS 1141.24	1 in 1,000 t	-	-
Percentage of Crushed Faces by AS 1141.18	1 in 250 t	-	-
Polished Aggregate Friction Value by AS 1141.40 or AS 1141.41	-	-	1 in 20,000 m2
Surface Texture Depth by WA 311.2	-	-	1 in 5,000 m2
Skid Resistance by WA 310.1	-	-	As nominated by Superintendent
Pavement Roughness and Rutting by WA 313.3	-	-	As nominated by Superintendent
Paint Resistance to Abrasion by WA 813.1	-	As nominated by Superintendent	-

**MMDD Curing Times**

Non-plastic gravels and sands: Minimum of 2 hours.  
Heavy clays (LL greater than 50): Minimum of 20 hours.  
Other materials: Minimum of 12 hours.

Check and report sub-base and basecourse thickness to nearest 5 mm at each modified compaction test sample site.

**11.56 CONFORMANCE TESTING RESULTS**

The Testing Contractor will provide interim test results to the Contractor within the following scheduled times from the time of ordering the tests. Interim test results may not be NATA endorsed.

Table – Testing and Reporting Completion times

SOILS	Time Allowed for Interim Report in Working Days	Time Allowed for NATA Endorsed Report in Working Days

TECHNICAL SPECIFICATION FOR RURAL ROADS  
CONFORMANCE TESTING



Field Density	3	5
Modified Compaction	** 3	5
Modified Compaction – Oversize	** 3	
Pavement Layer Thickness	2	4
Particle Size Distribution	3	5
Plasticity Index (Liquid Limit, Plastic Limit)	** 3	
Linear Shrinkage	3	
Moisture Content	1	3
CBR – Soaked (Completion time includes Modified Compaction)	** 7	9
Cement Content of Stabilised Materials (Heat of Neutralisation)	3	5
Cement Content (EDTA Method)	6	8
Lime/Cement Content of Uncured Soil (EDTA Method)	6	
Lime Content of Stabilised Materials (E.D.T.A Method)	6	
Bitumen Content of Stabilised Materials	2	4
Stabiliser Spread Rate	1	3
Soluble Salt Content of Construction Water	2	4
Standard Ball Penetration Test	1	3
Unconfined Compressive Strength (7 Day result) excluding compaction	8	10

**AGGREGATE**

Specific Gravity	2	4
Particle Size Distribution	2	
Particle Shape, by Proportional Calliper	2	
Flakiness Index	2	
Average Least Dimension (Direct Measurement)	2	
Clay and Fine Silt (Settling Method)	2	
Organic Impurities other than Sugar	2	5
Particle Density and Water Absorption of Fine Aggregate	3	
Particle Density and Water Absorption of Coarse Aggregate	3	4
Los Angeles Value	2	
Pavement Surface Texture Depth	2	
Sulphate Soundness	8	10



**CONCRETE**

Consistency of Concrete – Slump Test	1	3
Making, Curing and Compressive Strength (28 day result)	*** 25	27
Making, Curing and Compressive Strength (7 day result)	*** 6	8

**ASPHALT**

Bitumen Content and Aggregate Grading	3	5
Stability and Flow of Mix	3	
Voids and Density Relationship	4	6
Density of Thin Lift Asphalt by Nuclear Gauge	2	4
Bulk Density of Asphalt – Waxing Procedure	4	6
Kinematic Viscosity of Bitumen	3	5

\*\* Time for completion may be extended by one day if material is of high plasticity and requires a longer curing period.

\*\*\* From Date of Sampling.

### 3.12.44 Conformance of Compaction

Conformance of compaction will be based on lots.

Give each lot a lot number. Number the lots using a logical system. Maintain a register of all lots and lot numbers. Include the location of each lot on the lot register. Provide a copy of the lot register to the Superintendent upon request.

Lots of work will be selected by the Contractor, based upon:

- A lot will represent no more than one shift's production.
- A lot will be continuous and will have been brought to completion at the same time.
- A lot will be composed of essentially homogeneous material with no distinct changes in attribute values.

Defective sections will be excluded from the lot to be tested and identified as a separate lot, and shall also be subjected to lot testing.

Conformance of materials is based on samples from the finished works.

When lots fail to satisfy the conformance criteria, the entire lot shall be reprocessed and resubmitted for retesting.

Should the lot under consideration be subdivided then each subdivision will be classed as a lot and each subdivided lot will be subject to lot testing.

Non-conforming lots which are subdivided after testing will be treated as separate lots and each and every subdivided lot will be retested.

In situ density is expressed as a percentage of the Maximum Modified Dry Density. One Modified Dry Density test for each in situ density test will apply.

In situ density will be determined and reported in accordance with WA 133.1 OR WA 133.2 NTCP 102.1 and relevant Australian Standards.

A minimum of three tests will apply to each and every lot.



The Mean Dry Density Ratio (R) is calculated as follows:

$$R = \frac{\text{sum of } x_i}{n}$$

where  $x_i$  = an individual test result  
 $n$  = the number of results in the lot.

The Characteristic Mean Dry Density Ratio (Rc) is calculated as follows:

$R_c = R - ks$   
 where  $R$  = the mean dry density ratio for the lot  
 $k$  = the multiplier in the TABLE - MULTIPLIER VALUES  
 $s$  = the standard deviation.

The Standard Deviation (s) is calculated as follows:

$s = \sqrt{\frac{\text{sum of } (x_i - R)^2}{(n - 1)}}$   
 where  $x_i$  = an individual test result  
 $R$  = the mean of  $n$  results  
 $n$  = the number of test results in the lot.

When less than six tests are used to determine conformance of a lot the Mean Dry Density Ratios in the table DRY DENSITY RATIOS FOR CONFORMANCE, COLUMN A apply.

When six or more tests are used to determine conformance of a lot the Characteristic Mean Dry Density Ratios in the table DRY DENSITY RATIOS FOR CONFORMANCE, COLUMN B, apply.

Table - Dry Density Ratios for Conformance

Works Components	A	B	
	Mean Dry Density Ratio (R) % ("n" is 3 to 5)	Characteristic Mean Dry Density Ratio (Rc) % ("n" is 6 or greater)	
Natural surface to subgrade, fill, batters, table drain blocks, fill for water course, unpaved areas	90.0 or greater	90.0 or greater	Conformance
	89.9 or less	89.9 or less	Non-conformance
Subgrade, sub-base, shoulders, select fill, levees, structures and culverts in fill, bridge foundation backfill, bridge abutment fill	95.0 or greater	95.0 or greater	Conformance
	94.9 or less	94.9 or less	Non-conformance
Basecourse	100.0 or greater	99.0 or greater	Conformance
	99.9 or less	98.9 or less	Non-conformance
Stabilised basecourse	98.0 or greater	97.0 or greater	Conformance
	97.9 or less	96.9 or less	Non-conformance

The contractor will backfill all test excavations with the material and density ratio specified for that layer stabilised with at least 3% cement (by mass).

Table - Multiplier Values

Values of the Multiplier k for Characteristic Mean Dry Density Ratio (Rc)





Number of tests per lot (n)	k
6	0.50
7	0.54
8	0.56
9	0.59
10	0.61
15	0.68
20	0.72



## PAVEMENTS AND SHOULDERS

### 11.57 STANDARDS

Conform to the following Standards and Publication unless specified otherwise:

Conform to the following Standards and Publication unless specified otherwise:

AS 1141	Methods for Sampling and Testing Aggregates.
AS 1289	Methods of Testing Soils for Engineering Purposes.
AS 1672	Limes and Limestones for Building
AS 3705	Geotextiles - Identification, Marking and General Data
AS 3706	Geotextiles - Methods of Test
AS 1141.51	Unconfined Compressive Strength of Compacted Materials
AS 4133.4.1	Methods of Testing Rocks for Engineering Purposes Pt 4 - Rock Strength Tests Pt 1 - Determination of Point Load Strength Index
MRWATM	Main Roads Western Australia, Test Methods

### 11.58 DEFINITIONS

<b>SUB-BASE:</b>	One or more layers of material placed over the subgrade and below the basecourse and shoulders.
<b>BASE:</b>	That layer of pavement immediately above the subgrade or sub-base and / or below the bituminous surfacing extending for the full width of the pavement.
<b>ROUGHNESS:</b>	The roughness of the finished road surface in counts / km as measured by a NAASRA Roughness Meter.
<b>SHOULDER:</b>	That layer of material immediately above the sub-base or subgrade and adjacent to the pavement.

### 11.59 MATERIALS

#### 3.12.45 Gravel

Obtain material from sources of naturally occurring deposits.

Produce required properties by crushing, screening, mixing or other processes necessary.

Ensure particles are tough, durable and of a tightly binding nature free of organic or other deleterious matter.

Conform to the tables GRAVEL PARTICLE SIZES and GRAVEL PROPERTIES.

Table - Gravel Particle Sizes

AS SIEVE (mm)	PERCENTAGE PASSING			
	1	2	3	4
75.0	100			100
37.5	80 - 100	100		80 - 100
19.0	50 - 80	70 - 100	100	60 - 100
9.5	35 - 65	50 - 80	70 - 100	50 - 95
4.75	25 - 50	35 - 65	50 - 80	40 - 80
2.36	15 - 40	25 - 50	35 - 65	30 - 65
0.425	7 - 20	10 - 30	15 - 35	20 - 50
0.075	3 - 13	4 - 16	6 - 20	5 - 25

Gradings 2 and 3 are for Base.



Gradings 1 and 4 are for Sub-base.  
Gradings 2 and 3 are for Shoulder.

Table - Gravel Properties

	SEALED BASE	UNSEALED BASE AND SHOULDER MATERIAL	SUB-BASE
1. Liquid Limit (LL)	25% maximum	35% maximum	30% maximum
2. Plasticity Index (PI)	1 - 6%	4 - 12%	1 - 10%
3. Linear Shrinkage (LS)	0 - 3%	2 - 8%	0 - 6%
4. PI x % passing 0.425 mm Sieve	180 maximum	400 maximum	400 maximum
5. California Bearing Ratio (CBR) 4 day soaked at 2.5 mm penetration at a relative density of	80 minimum 100% MMDD	50 minimum 95% MMDD	30 minimum 95% MMDD
6. Los Angeles Abrasion (LAA) Loss	50 maximum	50 maximum	60 maximum

### 3.12.46 Sand Clay

A material complying with the following:

#### **Grading**

AS SIEVE (mm)	PERCENTAGE PASSING
4.75	80 - 100
2.36	60 - 100
0.425	30 - 60
0.075	14 - 28

#### **Properties**

Plasticity Index: 20 maximum for sealed pavements  
15 maximum for unsealed pavements.

Linear Shrinkage: 1% - 8%.

CBR, 4 day soaked at 95% MMDD  
at 2.5 mm penetration: 50 minimum.

### 3.12.47 Supply to Stockpile

Clear the site.

Ensure the area is free draining.

Spread and compact a 75 mm thick layer of sub-base gravel to 95% relative compaction.

Trim stockpile to a uniform shape for ease of measurement.

## 11.60 CONSTRUCTION

### 3.12.48 Mixing and Placing

Place material in uniform layers over subgrade surface or lower layers of the pavement.

Remove segregated and contaminated material from the site.

Do not place material on a previous layer that has

become waterlogged or cracked; and/or

otherwise deteriorated.



Mix the material uniformly throughout with water to achieve a moisture content within 2% of the optimum for the specified conforming Dry Density Ratio.

Ensure water is clean and free from oil, alkali, organic or any other deleterious substances, and that the total soluble salts content is less than 3,000 mg/litre (total dissolved salts). Provide evidence of construction water salt contents.

### 3.12.49 Compaction

Compact in uniform layers not less than 100 mm nor greater than 200 mm compacted thickness.

Achieve a homogeneous mass with no compaction planes.

Conform to the Dry Density Ratios specified in the table DRY DENSITY RATIOS FOR CONFORMANCE in the Conformance Testing Section.

### 3.12.50 Final Pavement Surface

Finish with a dense textured surface, free of laminations.

Allow pavements to dry back to a degree of saturation equal or less than 65% for FCR and 70% for natural gravel before priming/primer seal.

Degree of saturation is defined as follows:

$$S = \frac{\frac{P_w}{P_d} - 1}{APD} \times W\%$$

Where S = degree of saturation

APD = Apparent Particle Density

W = Moisture content %

P<sub>w</sub> = 1.0 t/m<sup>3</sup> (density of water)

P<sub>d</sub> = dry density

The Superintendent will carry out all testing to determine the degree of saturation.

Remove sticks and any loose material.

Ensure surface is free of cracking.

Do not introduce new material to the surface after final compaction.

Where pavement thickness is 200 mm or greater, scarify to not less than 100 mm depth and recompact where finish not achieved.

Where pavement thickness is less than 200 mm scarify and recompact to full depth where finish not achieved.

## 11.61 RECONSTRUCTION OF EXISTING PAVEMENTS

### 3.12.51 Widening

Cut back the existing pavement by not less than 150 mm width on each edge to sound material.

Excavate boxing for widening to the required depth below finished surface.

Construct subgrade as specified in the EARTHWORKS Section.

Construct pavement and shoulder as specified.

### 3.12.52 Strengthening and Renovating

Remove seal from existing pavements.

Cut across existing pavement at each end of work. Cut shall be vertical and at least 100 mm deep to allow smooth transition to new work.



Scarify local high spots to 75 mm below finished surface.

Construct a strengthening layer over the full width of the existing pavement and shoulder and the widening as specified.

## 11.62 CONFORMANCE

### 3.12.53 Tolerances

Refer MISCELLANEOUS PROVISIONS, Level Checking and Level Auditing.

Final surfaces shall conform to the following:

Level:	-20 mm to +20 mm.
Straight Edge Deviation:	maximum 5 mm in 3 m.
Compacted Thickness:	not less than specified.
Width:	not less than specified.
Sub-base Surface Level:	not higher than specified.
Surface Roughness at 80 km/h:	50 counts/km - maximum.

### 3.12.54 Proof Rolling - Notice – Approval - Notice

Proof roll all areas and obtain satisfactory results before ordering conformance testing of those areas.

Approval; submit a proof rolling procedure to the Superintendent for approval including the method of preparing an area and the extent of proof rolling.

Notice; Give the Superintendent not less than 24 hours notice of the location and commencement time for the proof rolling.

Plant Requirements; use plant in proof rolling procedures that comply with the following requirements:

- Static smooth wheeled rollers with a mass of not less than 12 tonnes and a load intensity under either the front or rear wheels of not less than 6 tonnes per metre width of wheel.
- Pneumatic tyred plant with a mass of not less than 20 tonnes and with a ground contact pressure under either the front or rear wheels of not less than 450 kPa per tyre and a ground contact area of not less than .035 m<sup>2</sup> per tyre.

Check areas for level tolerance and layer thickness before proof rolling.

Proof roll each layer immediately following completion of compaction. If proof rolling is carried out at a later time, water the surface and roll with the test roller prior to commencement of proof rolling.

Compliance; the proof rolling requirements are deemed to comply when an area withstands proof rolling without visible deformation or springing.

Remedial work; remove and reconstruct areas that deform or break up.

### 3.12.55 Conformance Testing - Approval

Ordering procedures; refer to the CONFORMANCE TESTING section for testing requirements and test ordering procedures.

Only the finished compacted base, sub-base and shoulder conforming to proof rolling, level tolerance and layer thickness will be tested.

Pavements and shoulders will be considered as separate lots.

Approval – obtain the Superintendent's approval for pavement conformance prior to any surfacing work.

Backfill and compact all test holes with cement stabilised quality material which is the same as the layer being tested.



### 3.12.56 Rideability

Surface roughness testing will be carried out by the Superintendent, at the discretion of the Superintendent.

### 3.12.57 Reconstruction of Existing Pavements

Measured in linear metres.

Make allowance for variation in pavement thickness and deformation of existing pavement.

### 3.12.58 Supply to Stockpile

Measured in cubic metres in the stockpile.



## BITUMINOUS SURFACING

### 11.63 STANDARDS

All works are to conform to the following Standards and Publications unless specified otherwise:

AS 1141	Methods for Sampling and Testing Aggregates.
AS 1152	Specification for Test Sieves
AS 1160	Bitumen Emulsions for Construction and Maintenance of Pavements.
AS 2008	Residual Bitumen for Pavements.
AS 2157	Cutback Bitumen.
AS 2341	Methods of Testing Bitumen and Related Road Making Products
AS NZS 2341	Methods of Testing Bitumen and Related Roadmaking Products.
AS 2758.2	Aggregates and Rock for Engineering Purposes - Aggregate for Sprayed Bituminous Surfacing.
AS 2809.5	Road Tank Vehicles for Dangerous Goods - Tankers for bitumen based products.
AS 3568	Oils for Reducing the Viscosity of Residual Bitumen for Pavements.
AUSTROADS	Bitumen Sprayers.
AUSTROADS	Bituminous Surfacing Sprayed Work January 1989 incorporating Amendments July 1990.

WA 0.1	Random Sample Site Location
WA 133.1	Dry Density/Moisture Content Relationship: Modified Compaction
WA 200.1	Sampling Procedures for Aggregates
WA 201.1	Sampling and Preparation of Granulated Rubber
WA 210.1	Particle Size Distribution of Aggregate
WA 212.1	Aggregate Moisture Content: Convection Oven Method
WA 212.2	Aggregate Moisture Content: Microwave Oven Method
WA 216.1	Flakiness Index
WA 220.1	Los Angeles Abrasion Value
WA 223.1	Crushing Test Value
WA 235.1	Bulk Density of Granulated Rubber
WA 236.1	Particle Size Distribution of Granulated Rubber
WA 237.1	Steel Content of Granulated Rubber
WA 238.1	Rubber Content of Bitumen/Rubber Blends
WA 311.1	Texture Depth
WA 312.1	Ball Embedment
WA 340.1	Sprayed Binder Application Rate: Carpet Tile Method
WA 700.1	Sampling Procedures for Bitumen and Oils
WA 756.2	Stone Coating and Water Resistance Test - Cationic Bitumen Emulsions

#### MAIN ROADS Standards

Standard 71-06-135 Materials for Bituminous Surfacing Treatments

### 11.64 GENERAL

The surface of the base course shall be primed and / or primer sealed prior to the application of the wearing course in accordance with the Specification.

Primer sealing will not be accepted unless followed by a final treatment. The whole treatment is to be discussed with and approved by the Officer.

Prime coats may be used in certain circumstances subject to approval by the Officer.

The pavement is to dry back to approximately 60% of Optimum Moisture Content before priming / primer seal.



## 11.65 MATERIALS

### 3.12.59 Class 170 Bitumen

The supply of bitumen shall meet the requirements of Main Roads WA Standard 71-06-135.

**Prior to the proposed use of bitumen, the Contractor shall notify the Superintendent in writing including full details of the nominated bitumen supplier, bitumen supply source and typical test results demonstrating conformance to the specification.**

The Contractor shall demonstrate compliance with bitumen property requirements by supplying copies of the nominated bitumen supplier's relevant certificate for each batch supplied during the Contract.

### 3.12.60 Audit Sampling and Testing

The Superintendent may take audit samples at any stage of the production, storage, delivery or application process. The frequency and timing of sampling will be at the Superintendent's discretion. The Contractor shall provide the Superintendent with ready access for sampling of bitumen.

The cost of material taken, cleaning of the sampling facility and any delays to road tankers or site operations as a result of the sampling shall be considered to have been included in the Schedule of Rates item for bitumen application. Sampling may be carried out by the Contractor on behalf of the Superintendent but a representative of the Superintendent shall be present at the time of the sampling.

When taking audit samples, two samples will be taken from a load immediately following one another in accordance with sampling procedure WA 700.1. They will be taken in such a manner that each is similar and represents the bitumen in the load. Each of the two sample containers will be marked with an identical reference number and other information in accordance with WA 700.1.

### 3.12.61 Bitumen Emulsion

The supply of bitumen emulsion shall meet the requirements of Main Roads WA Standard 71-06-135.

### 3.12.62 Protective Paper

Protective paper shall meet the requirements of Main Roads WA Standard 71-06-135.

### 3.12.63 Medium Curing Cutting Oil

The cutting oil shall meet the requirements of Main Roads WA Standard 71-06-135.

### 3.12.64 Slow Curing Cutting Oil

The cutting oil shall meet the requirements of Main Roads WA Standard 71-06-135.

### 3.12.65 Precoating Agent

Except for fine aggregates such as sands and crusher dust, all aggregate used as cover material with Class 170 bitumen or cut-back Class 170 bitumen shall be precoated with a distillate precoating agent meeting the requirements of Main Roads WA Standard 71-06-135.

Crushed aggregate for bitumen emulsion surfacing work shall not be precoated with precoating agents. However, the aggregate may be prewetted with water to assist adhesion of the binder.

### 3.12.66 Adhesion Agent

The adhesion agent, whether standard or concentrated, shall meet the requirements of Main Roads WA Standard 71-06-135.

### 3.12.67 Rubber Granules

The rubber granules shall meet the requirements of Main Roads WA Standard 71-06-135.

### 3.12.68 Anti-Foaming Agent (Rubberised Seal)

The anti-foaming agent shall meet the requirements of Main Roads WA Standard 71-06-135.





### 3.12.69 Aggregates

Crushed aggregate, including its source rock, shall meet the requirements of Main Roads WA Standard 71-06-135.

Where Principal-supplied aggregate cover material is made available to the Contractor, the Contractor shall use all such aggregate cover material before use is made of Contractor-supplied aggregate cover material. Details of Principal-supplied aggregate are given in the contract documents.

The source of aggregate supplied by the Contractor shall be nominated with the Tender.

The Contractor shall make all necessary arrangements with the nominated supplier concerning load size, rate for supply, timing of the delivery, payment and documentation.

**Prior to the on-site delivery of crushed aggregate, the Contractor shall provide certification to the Superintendent that the aggregate conforms to specified requirements.**

The Contractor shall organise all cover material supplied under this Contract into clearly identifiable stockpiles either at source or on site in order that they may be tested as required by the Quality Plan.

The maximum size of a lot shall be no more than one days production when applicable, or no more than approximately 2000 m<sup>3</sup>, whichever is the lesser.

Any contamination of aggregate after acceptance that is due in any way to the Contractor's activities shall be corrected at no cost to the Principal.

### 3.12.70 Crusher Dust/Sand

Crusher dust/sand used for primersealing shall meet the requirements of Main Roads WA Standard 71-06-135.

## 11.66 DESIGN OF BITUMINOUS SURFACING

### 3.12.71 General

Unless otherwise, the bituminous surfacing shall be designed by the Principal.

### 3.12.72 Design Methods

The design of bituminous surfacings shall include selection of binder class and design of binder and aggregate application rates unless otherwise specified. Design of binder application rates and aggregate spread rates shall be in accordance with the following:

- a) Primerseals (Sand and Metal dust). The primerseal design, binder composition, binder application rate and aggregate application rates shall be in accordance with the requirements of the Main Roads' "Primersealing with Cutback Bitumen Design Manual" (1985).
- b) Primerseals (Aggregate). The Primerseal design, binder composition, binder application rate and aggregate application rates shall be in accordance with the requirements of the Austroads Provisional Sprayed Seal Design Method Revision 2000 (AP-T09) or the Main Roads' "Primersealing with Cutback Bitumen Design Manual" (1985).
- c) Seals and Reseals (Class 170 bitumen). Single and Double – Double seal design, binder composition, binder application rates and aggregate spread rates shall be in accordance with the requirements of the Austroads Provisional Sprayed Seal Design Method Revision 2000 (AP-T09).
- d) SAM and SAMI Seals (Rubberised binder). Guidance on binder application rate design for SAM and SAMI seals is provided in Main Roads WA Engineering Road Note No 7 – "Bitumen Scrap Rubber Seals".
- e) Polymer Modified Bituminous Seals (PMB's). Rubberised seal coat applied as a water proof membrane on bridge decks shall have binder composition and binder application rates in accordance with Contract Documents.

Testing for Average Least Dimension (ALD) shall be carried out in accordance with AS 1141.20.1. Sampling for testing of ALD shall be in accordance with either AS1141.20.1 or WA 200.1. Testing for surface texture shall be in accordance with WA 311.1. Testing for ball embedment the test shall be in accordance with WA 312.1.



Where the design has been prepared by the Principal, the Superintendent will as necessary, order any variations to such design. Such amended details may include, but will not be necessarily limited to:

- f) Average Least Dimension (ALD) of the aggregate
- g) Aggregate precoating rate
- h) Binder Application Rate (BAR)
- i) Binder composition
- j) Aggregate spread rate
- k) Rolling and sweeping requirements

### 11.67 PREPARATORY OBLIGATIONS

### 11.68 BITUMEN STORAGE AND DISPOSAL FACILITIES

#### 3.12.73 Bitumen Storage Sites

1. **The Contractor shall select suitable sites for bulk storage of bitumen and notify the Superintendent at least five (5) days in advance of establishment or use. HOLD POINT**
2. The Contractor shall ensure that site layout and safe handling procedures conform to requirements detailed in AUSTROADS "Bitumen Sealing Safety Guide".
3. The Contractor shall provide and maintain the necessary equipment to receive, hold, heat, circulate, handle and protect bulk bitumen as required by his method of working from the time of receipt to prevent misuse, damage, deterioration or loss. **Equipment**
4. Bitumen heating and storage tanks shall be fitted with dipsticks for volume measurement and suitable thermometers for indicating the temperature of the bitumen.
5. The Contractor shall keep on the site for independent measurement of temperature, one mercury glass maximum recording thermometer calibrated up to 260°C, complete with a protective casing with cut out and lifting ring and one refill for the thermometer. **Thermometers**
6. Suitable equipment shall be supplied by the Contractor to facilitate removal of liquid used to flush pumps and lines to authorised waste disposal sites.
7. Storage tanks for slow curing cutting oil and medium curing cutting oil shall be fitted with dipsticks or flow meters for volume measurement and suitable thermometers for indicating temperature.
8. The accuracy of volume and temperature measurement facilities shall be sufficient to ensure that the binder constituents (adhesion agent excepted) proportions (expressed as percentages) are those ordered  $\pm 0.5\%$ . **Required Accuracy**

#### 3.12.74 Bitumen Disposal Sites – Notice - Approval

1. **The Contractor shall dispose of bitumen and bituminous products or other disposable items such as protective paper at an authorised waste disposal site.**
2. Any area so used without the approval of the Superintendent shall be made good immediately at no cost to the Principal.

## AGGREGATE DUMP SITES

### 7.1 GENERAL

1. The aggregate stockpile sites shall be constructed and maintained in a tidy condition and the Contractor's operations shall not contaminate aggregate in the stockpiles in any way. Surplus aggregate shall be removed from temporary stockpiles and the aggregate stockpile sites shall be fully cleaned and rehabilitated.



2. Where aggregate is supplied in stockpile by the Principal, the locations of the stockpile sites are as detailed in contract documents. Where aggregate is supplied by the Contractor, temporary stockpile sites shall be prepared and maintained in good condition by the Contractor.
3. **Prior to the stockpiling of aggregate, the Contractor shall nominate to the Superintendent the proposed location of the stockpile sites – Notice Approval.**

## 7.2 SITE PREPARATION

1. The Contractor shall prepare aggregate stockpile sites such that they incorporate a firm, smooth, plane, well-drained surface. Stockpile areas shall be of sufficient size to allow a 4m clear margin around each stockpile. **Site Requirements**
2. Clearing of sites shall be in accordance with Specification 301 **CLEARING**, and compaction shall be in accordance with EMBANKMENT FOUNDATION COMPACTION: PRINCIPAL'S METHOD SPECIFICATION as detailed in Specification 302 **EARTHWORKS**. Clearing and Compaction

## 7.3 PRECOATING

1. All aggregate shall be precoated at least 24 hours but not more than seven (7) days before its intended use. The rate of application of precoating agent shall be as stated in contract documents.
2. The application rate of precoating agent shall be within 20% of the ordered rate. Tolerance
3. Care shall be taken to minimise aggregate losses and to ensure dust does not blow back onto precoated aggregate.

## BITUMINOUS SURFACING APPLICATION

### 11.69 GENERAL

1. The application of bituminous surfacing shall include preparation of the surface, and the supply and application of various treatments over the widths, lengths and areas either as shown in the drawings and/or as specified in contract documents.

### 11.70 CLASS 170 BITUMEN BINDERS

#### 3.12.75 General

1. Bituminous surfacing using Class 170 bitumen as the principal binder shall consist of one or more of the following treatments:

#### 3.12.76 Prime Coats

1. Class 170 residual bitumen shall be mixed with medium curing cutting oil and adhesion agent in the proportions as detailed in contract documents. The blend and application rate of the binder shall be varied according to the base and the temperature at the time of application to ensure penetration of the base. **Prime Coats**

#### 3.12.77 Primerseal Coats

1. Class 170 residual bitumen mixed with slow curing cutting oil, and/or medium curing cutting oil, and adhesion agent in the proportions as detailed in contract documents. To ensure a stable aggregate mat, the blend and application rate of the binder shall be varied for each sand/crusher dust primerseal according to the temperature at the time of application and the particle size distribution of the sand/crusher dust. **Primerseals**

#### 3.12.78 Seal and Reseal Coats

1. Class 170 residual bitumen mixed with adhesion agent as detailed in contract documents. Seals and Reseals
2. Depending on the anticipated road temperature, medium curing cutting oil shall be added to the binder in accordance with contract documents.



3. Additionally for Rubberised Seal Coats, the binder shall incorporate rubber granules and anti-foaming agent, and shall be blended with adhesion agent and medium curing cutting oil in accordance with contract documents. Rubberised Seals
4. Rubberised Seal Coats shall apply to bridge deck surfaces, and as Stress Alleviating Membranes (SAMs) and Stress Alleviating Membrane Interlayers (SAMIs) for road pavements. SAMs & SAMIs

## 11.71 BITUMEN EMULSION BINDERS

### 3.12.79 General

1. Bituminous surfacing using bitumen emulsion as the principal binder shall consist of one or more of the following treatments:

### 3.12.80 Prime Coats

1. Bitumen emulsion prime coats as typically used on bridge decks prior to subsequent bituminous surfacing treatments shall be applied in accordance with contract documents . **Bridge Decks**
2. Bitumen emulsion shall not be used for priming pavements, as the essential penetration of the basecourse by the binder may not be achieved using bitumen emulsion binders. **Road Pavements Excluded**

### 3.12.81 Primerseal Coats

1. One or two coat bitumen emulsion primerseal using the nominal sized crushed aggregates specified in contract documents . Binder Application Rates (BAR) shall be as specified at contract documents . Primerseals
2. Bitumen emulsion primerseals shall not be subject to any vehicular traffic until the emulsion has completely broken and cured to form a stable primerseal leaving no water in the binder. **Traffic Ban**

### 3.12.82 Seal Coats

1. Either one or two coat bitumen emulsion seals using the nominal sized crushed aggregate as specified in contract documents . Binder Application Rates (BAR) shall be as specified in contract documents. **Seals**
2. Bitumen emulsion seals shall not be subject to any vehicular traffic until the emulsion has completely broken and cured to form a stable primerseal leaving no water in the binder. **Traffic Ban**

## 11.72 PLANT AND EQUIPMENT

### 3.12.83 Mechanical Sprayer

1. Binder shall be applied using a bulk bitumen sprayer of minimum capacity 5 000 litres. The sprayer shall comply with the relevant sections of "Specification for Mechanical Sprayers of Bituminous Materials" issued by AUSTROADS. In addition to the above requirements, the sprayer dipstick shall be calibrated in 50 litre increments, and unless the sprayer is of the air pressure type, the spray bar shall be fully circulating.
2. The sprayer shall have been tested for uniformity of transverse distribution and calibrated for overall rates of application. The tests shall have been performed within the past twelve (12) months for spray rates at least 15 per cent higher than required for the Works. **Sprayer Calibration**
3. **Prior to the use of the sprayer on the Works, the Contractor shall make available to the Superintendent the calibration certificate for the sprayer. The Superintendent may require the sprayer to be made available at the Main Roads' Pavement Engineering at Welshpool, Perth, for inspection and testing prior to or during execution of the work.**  
Notice - Approval



4. The Superintendent may request prior to the commencement of Works, or at anytime during the Works, that the sprayer be tested for uniformity of spray bar output, particularly transverse application, in accordance with WA 340.1. The test will be conducted for the maximum spray bar width to be used in this Contract. The requirements for the spraybar output and distribution are shown below:
  - a) The mean binder application rate of the width tested shall not exceed  $\pm 10\%$  of the binder application rate at 15°C specified for the Works;
  - b) Every tile used in the test which was fully coated shall have a binder application rate within 15% of the mean binder application rate for the width tested;
  - c) Not more than two consecutive tiles that have been fully coated shall have a binder application rate exceeding  $\pm 10\%$  of the mean binder application rate for the width tested.
5. If the sprayer does not conform to the requirements shown above it shall not be used on the Works. Subsequent tests to confirm conformity will be at the Contractor's cost. Any delays to site operations because of conducting these tests are not claimable as separate costs. **Sprayer Conformity**
6. The Contractor shall use Copley EAN 18 MRWA (previously EA4 MRWA) End Nozzles for use in spraying edges. Copley AN18 (previously A4) nozzles shall be fitted to the remainder of the spray bar. **Spray Nozzles**
7. Sprayer for Rubberised Seal Treatment - Additional Requirements Rubberised Seals
  - a) The sprayer shall be fitted with a circulating system which shall include a return pipe along the full length of the bottom of the tank fitted with upward directed jets every 50mm and downward directed jets in the vicinity of the internal suction pipe such that the contents of the tank can be circulated through this bottom pipe at a rate of approximately 800 litres/minute to keep the rubber homogeneously dispersed in the bitumen at all times. The sprayer tank shall be fitted with a valve controlled bottom outlet to facilitate external circulation if the need arises. The heating capacity of the sprayer shall ensure reheating of the blended product at a rate of approximately 20°C per hour.
  - b) The spray bar shall be of the fully circulating type. The spray bar width shall not exceed 4 metres.

### 3.12.84 Blending Machine For Rubberised Seal

1. The rubberised binder shall be supplied from a bulk mixing facility. The facility shall be capable of mixing the rubber blend to ensure that the rubber is thoroughly mixed into the bitumen before it is transferred to the sprayer. **Bulk Supply**
2. Alternatively, the Contractor shall supply a blending machine specifically designed to load and mix rubber granules into hot bitumen during the transfer of hot bitumen from storage to the sprayer. The rubber shall be thoroughly mixed into the bitumen before it enters the sprayer. **Blending During Transfer**

### 3.12.85 Rollers

1. Rollers shall be rubber tyred rollers, and shall be self-propelled with minimum mass of 11 tonnes and have multi wheels each exerting a minimum load of 10 kN. The wheels shall have smooth pneumatic tyres inflated to pressures of at least 700 kPa. **Rubber Tyred Rollers**

### 3.12.86 Road Broom

1. The units shall be a mechanically or power driven roller broom, capable of removing excess cover material and/or other loose material from the pavement surface without damage to the existing primerseal or seal surface.
2. The broom and its prime mover, shall each be equipped with an amber rotating beacon visible from all directions in accordance with Specification 203 **OCCUPATIONAL SAFETY AND HEALTH**. Rotating Beacon



### 3.12.87 Drag Broom

1. The units shall consist of fixed brushes fitted to a frame and shall be capable of distributing loose cover material laterally and longitudinally. The drag broom shall not dislodge particles embedded in the binder or damage the surface in any way. Brooms shall be angled, height adjustable and suspended under rubber tyred rollers.

### 3.12.88 Precoater

1. The precoater shall be capable of applying a uniform film of precoat agent to cover all of the surface area of the aggregate particles at a controlled and variable rate. The precoater shall have sufficient output capacity to maintain an adequate supply to the bitumen sprayer(s).
2. The precoater shall also be capable of screening dirt/foreign matter (both oversize and undersize materials) from the aggregate during its operation. **Screening**
3. **Prior to the use of the precoater on the Works, the Contractor shall notify the Superintendent of such intention. Notice - Approval**

### 3.12.89 Surface Damage

1. In the event of any fuel or oil leaks or spillages onto the newly sealed surface, or any other damage to the newly sealed surface the Contractor shall reinstate the surface and or the underlying basecourse to its pre-damage condition at no cost to the Principal. **Care of Works**

## 11.73 SURFACE PREPARATION

### 3.12.90 Basecourse Surface

1. The pavement surface to be surfaced with bituminous binder shall be swept clean of all loose sand, stones, dust and other foreign matter before surfacing. Adherent patches of foreign matter shall be removed by using hand brooming and steel scrapers or similar methods.
2. Loose material shall be swept a sufficient distance off the pavement to permit execution of the bituminous binder.
3. **No binder shall be applied to a basecourse lot until it has dried back such that the Characteristic Moisture Content of both the upper half and lower half of the basecourse layer is less than or equal to the proportion of the Optimum Moisture Content (OMC) as specified in pavements section, and the surface is sufficiently dry to permit application of the binder. The OMC shall be determined by WA 133.1 or 133.2.** Basecourse Dryback
4. Where no such proportion of OMC is specified in pavement section, the Characteristic Moisture Content of the basecourse shall be dried back to 85% of OMC.
5. The Dryback Characteristic Moisture Content (DMc) is defined by the expressions:

$$DMc_{Upper} = m_1 + ks_1 \text{ and}$$

$$DMc_{Lower} = m_2 + ks_2.$$

Where  $m_1$  = average of 9 sample moisture contents, taken from the upper half of the basecourse layer and determined in accordance with WA 110.1.

$m_2$  = the average of 9 sample moisture contents, taken from the lower half of the basecourse layer and determined in accordance with WA 110.1.

$k$  = 0.81 for Freeways, 0.59 for Highways and Main Roads and 0.41 for Dual Use Paths.

$s_1$  = standard deviation of the 9 sample moisture content determinations taken from the upper half of the basecourse layer, calculated using the following relationship and reported to the nearest 0.1.





$$S_1 = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{(n-1)}}$$

Where  $x_i$  is an individual result,  
 $\bar{x}$  is the mean of  $n$  results  
 $n$  is the number of results from one lot.

$S_2$  = standard deviation of the 9 sample moisture content determinations taken from the lower half of the basecourse layer, calculated using the following relationship and reported to the nearest 0.1

$$S_2 = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{(n-1)}}$$

Where  $x_i$  is an individual result,  
 $\bar{x}$  is the mean of  $n$  results  
 $n$  is the number of results from one lot

6. The Contractor shall set out and mark the edge of the binder at a position to achieve the specified tolerances and to suit the method of work employed. The Contractor shall provide such additional markers as are necessary to achieve the specified tolerances. **Line Marking**
7. Application of a light water spray shall precede the application of either a prime or primerseal. The application of the light spray shall be consistent across the width of the proposed seal Works. **Light water spray**
8. **Prior to the application of bituminous binder as an initial surfacing treatment, the Contractor shall certify to the Superintendent that the basecourse complies in all respects with the requirements of the Specification, excluding the surface finish as described in pavements section. HOLD POINT**
9. **At the completion of the Basecourse surface being swept and prior to the application of the bituminous binder, the Contractor shall certify to the Superintendent that the basecourse complies with the surface finish requirements of the Specification and that the surface is suitable to receive the bituminous binder. The Contractor shall request the release of this Hold Point in writing after the sweeping of the basecourse is completed and at least one (1) hour prior to the application of the bituminous binder. Notice – Approval**

### 3.12.91 Existing Bitumen Surface

1. Where the pavement surface to be surfaced is an existing bitumen surface, or has been surfaced or sealed with bitumen as part of previous operations, the surface shall be swept clean of all loose sand, stones, dust and other foreign matter before surfacing. Adherent patches of foreign matter shall be removed by using hand brooming and steel scrapers or similar methods.
2. Loose material shall be swept a sufficient distance off the pavement to permit execution of the bitumen surfacing.
3. **A minimum of one (1) hour prior to the bituminous surfacing as a subsequent surfacing treatment being applied, the Contractor shall certify to the Superintendent that any required sweeping and/or necessary repairs of the underlying surface have been completed, and that the surface is suitable to receive the subsequent bituminous treatment. Notice - Approval**
4. Where encountered in resealing works, the Contractor shall remove and dispose of existing raised pavement markers, both permanent and temporary, prior to resealing. The pavement



markers shall only be removed at the commencement of works for the day, and shall be removed only from the section to be resealed on that day. Any area of the pavement damaged by the Contractor shall be repaired by the Contractor at no cost to the Principal.

**Raised Pavement Markers**

**3.12.92 Bridge Decks**

1. Bridge deck surfaces shall be swept clean of all loose sand, stones, dust and other foreign matter before sealing. Adherent patches of foreign matter shall be removed by hand brooming, or by using steel scrapers, or similar methods.
2. The surface shall be primed with a cationic slow setting emulsion (Grade CSS/50-60). No binder, including rubberised binder, shall be applied on the prime until the emulsion has broken and has evaporated. **Emulsion Grade**
3. All traffic shall be kept off the bridge deck until application of the binder is complete and conforms to all requirements.

**11.74 PROVISION FOR TRAFFIC**

1. The Contractor shall minimise delays and inconvenience to road users during the course of the work. Traffic shall not be allowed on the new work until sufficient rolling has taken place to prevent damaging the freshly applied bituminous mat.
2. The Contractor shall supply signs, lights, plus any other necessary equipment, and erect and maintain same in good condition in accordance with Specification 202 **TRAFFIC MANAGEMENT**.
3. Signs inscribed "**ROADWORKS IN PROGRESS FOR NEXT ... KM**" shall be erected at each end of unswept work where the length of the work, intermittent or continuous, exceeds 1 kilometre. **Signing**
4. Signs shall remain in position until after the seal is swept with no loose stones remaining on the surface. No item of plant will be permitted to operate outside the appropriate warning signs. All signs shall be free standing.
5. The Contractor shall provide at least two persons on a full time basis as traffic controllers. Warning signs shall always be erected in conjunction with the use of traffic controllers. Each traffic controller shall be equipped with a portable two-way radio, plus a spare and wear a high visibility vest. **Traffic Controllers**
6. **Prior to implementing any proposed traffic control measures for the Works, particularly temporary speed restrictions, the Contractor shall notify the Superintendent of such proposed measures.** Notice - Approval

**11.75 BINDER PREPARATION**

**3.12.93 Conventional Binders**

1. Bitumen and other constituents shall be mixed by circulation in the mechanical sprayer for not less than fifteen minutes immediately prior to application or such longer periods as may be necessary to ensure a uniform and homogeneous mixture. **Mixing**
2. Adhesion agent shall be added to the sprayer on site, dissolved in the hot binder and thoroughly mixed. The binder shall be sprayed within three (3) hours of adding the adhesion agent to the binder. Where the binder has not been sprayed within three (3) hours, further adhesion agent shall be added to the remaining binder.
3. Adhesion agent shall be added at least to the minimum level specified or ordered. All other binder constituent proportions (expressed as percentages) shall be those specified or ordered + 0.5%. **Mix Tolerance**





### 3.12.94 Bitumen Emulsions

1. Bitumen emulsion shall be mixed by circulation in the mechanical sprayer for not less than ten minutes or such longer period as may be necessary to ensure a uniform and homogeneous mixture. **Mixing**
2. Where a pressurised sprayer is used circulation in the site storage or road tanker shall be permitted as a substitute for circulation in the sprayer. Such circulation shall take place immediately prior to the loading of the sprayer.

### 3.12.95 Rubberised Binders

1. The granulated rubber shall be added to the bitumen using either a bulk blending facility, or a blending machine designed to mix the rubber into hot bitumen during transfer of the bitumen from storage to the sprayer.
2. The granulated rubber shall be added to the bitumen shortly before spraying is planned, using an approved blending device, in such a manner as to produce a homogeneous mixture. After completion of addition of the rubber granules to the bitumen the mixture shall be circulated in the mechanical sprayer using the bottom circulating pipe for a minimum period of 45 minutes to ensure thorough mixing and provide sufficient reaction time. **During Transfer**
3. The rubber granules shall be added to the bitumen using an approved bulk blending facility. After addition of all of the rubber, the blend shall be mixed in the bulk facility for 1 hour to ensure thorough mixing and provide sufficient reaction time. After the mixing the blend shall be transferred to a bitumen sprayer. The rubber blend shall not be transferred into a road tanker without the approval of the Superintendent. **Bulk Facility**
4. Following the mixing time in either the sprayer or the blending facility the specified percentage of medium curing cutting oil and adhesion agent shall be added to the blend in the sprayer. The binder shall then be circulated using the bottom circulating pipe for a minimum of 15 minutes to ensure a uniform and homogeneous mixture. **Addition of Cutter**
5. The binder shall be sprayed within twelve (12) hours of the completion of adding the rubber to the bitumen. Binder not sprayed within this time period shall be deemed non-conforming. In addition, the binder shall be sprayed within eight (8) hours of adding the appropriate adhesion agent to the binder. Where the binder has not been sprayed within eight (8) hours, further adhesion agent shall be added to the remaining binder. **Spraying Time**

## 11.76 APPLICATION - CLASS 170 BITUMENS

### 3.12.96 General

1. The surface to be sealed shall be dry and no binder shall be applied during wet or rainy conditions, or when adverse weather conditions may prevail at any time during such work. No binder shall be applied whilst the pavement surface temperature is less than: **Weather**
  - a) 25°C for seals and reseals, including rubberised work, or Minimum Pavement Temperature
  - b) 20°C for primes or primerseals.
2. The Contractor shall provide the Superintendent with safe and convenient access to the sprayer at all times for checking the volume before and after spraying by means of the dipstick.

### 3.12.97 Application Rate

1. Where adjustments to the binder application rates in excess of 7.5 percent of the rates nominated are ordered by the Superintendent then changes to the Contractor's rates for sealing shall be made as follows:

$$\text{URN} = \text{URT} + (\text{ARN} - \text{ART})\text{L}$$

Where :



- URN = New Rate for prime, primerseal or seal (\$ per m<sup>2</sup>).  
 URT = Tendered rate for prime, primerseal or seal as applicable (\$ per m<sup>2</sup>)  
 ARN = New binder application rate (Litres per m<sup>2</sup>).  
 ART = Tendered binder application rate (Litres per m<sup>2</sup>).  
 L = Rate per litre tendered for variation in the Schedule of Rates (\$ per litre).

2. Adjustments made under this clause shall be made prior to any adjustments that are due to conditional acceptance.
3. The actual BAR at 15°C shall be calculated from the quantity of binder sprayed and the actual area covered as measured on the ground.
4. On sections where the actual binder application rate differs from the ordered application rate and the work is deemed to be non-conforming refer to Clause 9.3.5.

### 3.12.98 Volume Conversion

1. Table 8.1 (for prime coats) and Table 8.2 (for primerseals, seals and reseals) give factors to be used when converting binder volumes or spray rates at temperatures other than 15°C to volumes or spray rates at 15°C or vice versa. Adjustment shall be made using the following formulae:-
  - a) Volume or spray rate at 15°C equals the Volume or spray rate at T °C multiplied by the Factor for T °C
  - b) Volume or spray rate at T °C equals the Volume or spray rate at 15°C divided by the Factor for T °C

**Table 8.1 - Conversion Factors - Prime Coats**  
Binder blend of 40% bitumen – 60% mc cutter

Observed Temp T °C	Factor For T °C	Observed Temp T °C	Factor For T °C	Observed Temp T °C	Factor For T °C
15	1.000	80	0.9543	145	0.9105
20	0.9964	85	0.9509	150	0.9072
25	0.9929	90	0.9475	155	0.9039
30	0.9893	95	0.9441	160	0.9007
35	0.9857	100	0.9407	165	0.8974
40	0.9822	105	0.9373	170	0.8942
45	0.9787	110	0.9339	175	0.8909
50	0.9752	115	0.9305	180	0.8877
55	0.9717	120	0.9272	185	0.8845
60	0.9682	125	0.9238	190	0.8813
65	0.9647	130	0.9205	195	0.8781
70	0.9612	135	0.9171	200	0.8749
75	0.9578	140	0.9138		

NOTE: Factors for intermediate temperatures may be obtained by direct interpolation.



Table 8.2 - Conversion Factors - Primerseals, Seals & Reseals

Observed Temp T °C	Factor For T °C	Observed Temp T °C	Factor for T °C	Observed Temp T °C	Factor For T °C
15	1.000	80	0.9597	145	0.9207
20	0.9969	85	0.9567	150	0.9177
25	0.9937	90	0.9536	155	0.9148
30	0.9906	95	0.9506	160	0.9118
35	0.9875	100	0.9476	165	0.9089
40	0.9844	105	0.9446	170	0.9060
45	0.9813	110	0.9416	175	0.9031
50	0.9782	115	0.9385	180	0.9002
55	0.9751	120	0.9356	185	0.8973
60	0.9720	125	0.9326	190	0.8944
65	0.9689	130	0.9296	195	0.8915
70	0.9658	135	0.9266	200	0.8886
75	0.9628	140	0.9236		

NOTE: Factors for intermediate temperatures may be obtained by direct interpolation.

### 3.12.99 Spraying

1. The binder shall be bar circulated for at least three (3) minutes immediately prior to spraying.
2. The spraying of the binder for each run of the sprayer shall start and finish on protective paper. The sprayer shall start each run at least 10m before the protective paper and shall cross the paper at its correct spraying speed. The sprayer shall maintain its correct spraying speed over the full length of each run and shall cross the finish paper at this speed. All tapers and fillets shall be sprayed after masking with protective paper. The paper so used and any spilt bitumen shall be removed and disposed of in a suitable manner. **Sprayer Speed**
3. The volume of binder sprayed for each run shall be determined by dipping the tank after each run and recording the volume of binder in the tank to the nearest 50L. The sprayer must be dipped whilst parked on level ground. **Sprayed Volume**
4. All outside edges of the seal, parallel to the road centreline shall be sprayed with Copley EAN18 (MRWA) edge nozzles.
5. Where the direct use of the mechanical sprayer is impracticable, the binder may be applied by using a hand lance fed from the mechanical sprayer.
6. The binder shall be sprayed onto areas as detailed in the drawings, or as otherwise specified between two lines as defined by the line markers and the surfacing widths. The sprayed binder edge shall conform to the following requirements: **Spraying Tolerances**
  - a) the sprayed edge shall not deviate from the specified edge by more than 50 mm;
  - b) the rate of deviation of the sprayed edge from the specified edge lines shall not exceed one in four hundred (1: 400);
  - c) tapers to accommodate variations in specified width shall be at one in one (1:1), except at floodway exits, which shall be at one in twenty (1:20).
7. The Contractor shall take all necessary precautions to prevent binder from adhering to any existing structure. Any damage or defacement shall be made good by the Contractor at no cost to the Principal immediately surfacing work on a section has been completed. **Damage**

### 3.12.100 Application of primer coat

1. Construction traffic shall not be allowed on newly sprayed areas until the prime has penetrated and the sprayed surface is no longer tacky



2. Where construction traffic must be allowed on areas that remain tacky and on isolated slick spots, the prime shall be dusted over with a dry sand or fine aggregate cover material and lightly rolled prior to trafficking
3. Public traffic shall not be allowed on primed areas without the approval of the Superintendent.
4. The Contractor shall repair at no cost to the Principal any damage to the prime coat caused by construction or public traffic.
5. All tacky or slick spots shall be blinded with dry sand or fine aggregate prior to the application of the next specified bituminous surface treatment.
6. The prime coat shall be cured for a period of three (3) to seven (7) days prior to the application of a subsequent bituminous surfacing treatment. Dependent upon factors such as the blend to be used, climatic conditions and the porosity of the basecourse, a reduced curing time of not less than 24 hours may be approved by the Superintendent.

### 3.12.101 Existing Guideposts

1. Where necessary existing guideposts shall be removed and stored safely by the Contractor to allow bituminous surfacing operations to proceed. **Guidepost Removal**
2. Where not being replaced with new guideposts, the Contractor shall reinstate removed guideposts in their original locations at the completion of bituminous surfacing operations. Any guideposts damaged during their removal or reinstatement shall be replaced by the Contractor at no cost to the Principal. **Reinstatement**



## APPLICATION OF COVER MATERIAL

### 11.77 AGGREGATE PRIMERSEALS AND SEALS

#### 3.12.102 General

1. The aggregate shall be dry (containing no water) at the time of application and shall be uniformly spread over the sprayed area by means of a suitable type of mechanical spreader. The mechanical spreader shall be fitted with removable cut-off attachments to allow the aggregate spread width to match the required width on the pavement. The time lag between spraying and spreading shall be kept to a minimum and all sprayed areas, with the exception of approved lapping strips, shall be covered with aggregate within ten (10) minutes of spraying the binder. The length of spray runs shall be limited to ensure compliance with this requirement.
2. **Prior to the spreading of the aggregate, the load in a truck representative of those to be used for the Work shall be levelled in the body for measurement purposes.** Notice
3. The aggregate shall be placed to form a uniform stone mosaic of single particle thickness, in almost continuous interlocked contact, generally orientated with their least dimension vertical. In order to meet this requirement it may be necessary to apply the aggregate initially at a rate slightly less than appears optimum so that some binder is visible between the stones. Specified aggregate application rates are nominal and should be adjusted to suite the aggregate used to give the correct stone mosaic.

#### 3.12.103 Additional Aggregate

1. Additional aggregate shall be applied to any bare or insufficiently covered areas as necessary to provide a uniform and complete cover. Where the area to be covered with additional aggregate is not of uniform width the additional aggregate shall be spread by hand.
2. Additional aggregate shall be applied before the completion of four passes of rubber tyred rolling.
3. If there are surplus loose particles on any portion of the sealed area, such portion shall be swept lightly to move the loose particles but not disturb the aggregate embedded in the binder.

#### 3.12.104 Timing

##### Principal Supplied Aggregate

1. Where the actual aggregate spread rate is less than 0.925 times the ordered aggregate spread rate the cost of any additional aggregate used supplied by the Principal (calculated as below) shall be deducted from payments due to the Contractor. **Spread Rate**

$$\text{Cost of additional aggregate} = A \times R \left( \frac{1}{S_a} - \frac{1}{0.925S_o} \right) \text{ Aggregate Cost}$$

where:  $A$  = actual area ( $m^2$ ) covered at rate  $S_a$

$R$  = rate (in  $\$/m^3$ )

$S_o$  = ordered aggregate spread rate in  $m^2/m^3$

$S_a$  = actual aggregate spread rate in  $m^2/m^3$

2. The cost of aggregate spread outside the specified area (with due allowance for tolerances) shall be deducted from money due to the Contractor at the rate stated in contract schedule

#### 3.12.105 Rolling and Drag Brooming

1. Immediately after application of the cover material, the surface shall be rolled with rubber tyred rollers over the whole area. For the first four passes, rollers shall be operated at speeds less



than 7 km per hour. Drag brooming shall be carried out after every second pass of rolling. **Rolling Sequence**

2. The Superintendent may order additional rolling and drag brooming and such extra work shall be paid for at Dayworks rates.
3. For double coat seals, the rolling shall comply with the requirements of this section for each coat of the seal and any aggregate not incorporated in the first coat of the seal shall be removed in such a manner as to prevent removal of aggregate incorporated therein. Any damage to the first coat shall be repaired by the Contractor at no cost to the Principal prior to spraying the binder for the second coat. **Double Coat Seals**

### 3.12.106 Surface Sweeping

1. Any loose cover material not incorporated in the seal after the completion of rolling shall be swept off the seal surface to beyond the outer edge of each shoulder without damage to seal, shoulder or guideposts, and shall then be dispersed such that no windrows of swept material remain.
2. Where the roadway to be sealed is kerbed the excess cover material may be swept hard against the kerb during interim sweeping operations but shall be picked up and removed during the final sweeping. **Excess Cover Material**
3. The initial sweeping shall take place prior to the completion of the day's work. A second sweeping shall be carried out at the commencement of the following day's work. The Contractor shall carry out subsequent sweepings as necessary for the following seven (7) days to ensure that no loose stones remain on the road surface. **Repeated Sweeping**
4. The Contractor shall install symbolic "loose stones" signs and other temporary traffic management signs. The signs shall remain in place on each section of the Works for the following seven (7) days after completion of sealing. **Signing**

## 11.78 SAND/CRUSHER DUST PRIMERSEALS

### 3.12.107 General

1. The cover material shall be dry at the time of application and shall be uniformly spread by means of a suitable type of mechanical spreader. The time lag between spraying and spreading shall be kept to a minimum and all sprayed areas, with the exception of approved lapping strips, shall be covered with material within ten (10) minutes of spraying the binder. The length of spray runs shall be limited to ensure compliance with this requirement.
2. **Sufficient loaded trucks shall be at the site to provide the full cover for the area to be sprayed at the time. Prior to the spreading of the cover material, the load in a truck representative of those to be used for the Work shall be levelled in the body for measurement purposes.** HOLD POINT

### 3.12.108 Additional Cover Material

1. Additional cover material shall be applied to any bare or insufficiently covered areas as necessary to provide a uniform and complete cover. Sufficient cover material shall be spread to fully absorb the binder applied and to ensure that there is no picking-up under traffic.

### 3.12.109 Cover Material Spread Rate and Drag Brooming

1. The actual cover material spread rate shall be calculated from the volume of cover material spread and the actual area covered as measured on the ground.
2. Sufficient cover material (sand or crusher dust) must be spread and rolled into the binder to fully absorb the bituminous material applied. To achieve this result it may be necessary to slightly overspread the aggregate and broom off any excess once a stable bitumen-aggregate mat has been achieved.



### 3.12.110 Rolling

1. Immediately after application of the cover material, the surface shall be rolled with rubber tyred rollers over the whole area. Rollers shall not be operated at speeds in excess of 7 km per hour for the first four passes.

### 3.12.111 Sweeping

1. Any loose cover material not incorporated in the primerseal after the completion of rolling shall be swept off the surface to beyond the outer edge of each shoulder without damage to the primerseal or shoulder and spread evenly down the batter slope.
2. The Contractor shall not install guideposts prior to the sweeping of loose cover material down the batter slope.
3. The time lapse between the completion of rolling and final surface sweeping shall be determined by the Superintendent. However, such time lapse shall not be greater than one week and may be as short as one day.

## 11.79 APPLICATION - BITUMEN EMULSIONS

### 3.12.112 Binder Application

1. Binder shall not be applied during wet or rainy conditions, nor when adverse weather conditions may prevail at any time during such work. Binder shall be applied only when the pavement temperature is between 10°C and 40°C. **Pavement Temperature**
2. The binder spraying temperature range shall be 35°C to 50°C for conventional emulsions, and shall be 50°C to 80°C for high bitumen content emulsions **Spraying Temperature**
3. The emulsion binder rates at 15°C for tender purposes shall be as specified in Table 8.3 and 8.4..
4. The spraying of the binder for each run of the sprayer shall start and finish on protective paper. The sprayer shall start each run at least 10 m before the protective paper and shall cross the paper at its correct spraying speed. The paper so used and any spilt binder shall be removed and disposed of in an approved manner. All tapers and fillets shall be sprayed after masking with protective paper. All outside edges shall be sprayed with Copley EAN18 edge nozzles. Where the direct use of the mechanical sprayer is impracticable, the binder may be applied using a hand lance fed from the mechanical sprayer.
5. The volume of binder sprayed for each run shall be determined by dipping the tank after each run and recording the volume of binder in the tank to the nearest 50L. The sprayer must be dipped whilst parked on level ground. **Sprayed Volume**
6. The binder shall be sprayed onto areas as detailed in the drawings, or as otherwise specified between two lines as defined by the line markers and the surfacing widths given in Table 8.3 and 8.4.. The sprayed binder edge shall conform to the following requirements: **Spraying Tolerances**
  - a) the sprayed edge shall not deviate from the specified edge by more than 50 mm;
  - b) the rate of deviation of the sprayed edge from the specified edge lines shall not exceed one in four hundred (1: 400);
  - c) tapers to accommodate variations in specified width shall be at one in one (1:1), except at floodway exits, which shall be at one in twenty (1:20).
7. The Contractor shall take all necessary precautions to prevent binder from adhering to any existing structure. Any damage or defacement shall be made good immediately upon completion of sealing work at no cost to the Principal.
8. In two-coat applications, the binder for the second coat shall not be applied until the binder in the first coat has completely broken and cured to form a stable primerseal leaving no water in the binder. **Two-coat Applications**





### 3.12.113 Application of Aggregate - Two Coat Applications

#### **First Coat (Larger Aggregate)**

1. The first aggregate coat shall be uniformly spread by means of a suitable type of mechanical spreader. The aggregate shall be applied commencing at the low edge of the pavement in successive runs parallel to that edge.
2. This requirement may be waived at tapers depending upon the method of application of the binder for the taper.
3. The aggregate shall be placed to form a uniform stone mosaic of single particle thickness, in almost continuous interlocked contact, with the particles generally oriented with their least dimension vertical. In order to meet this requirement it may be necessary to apply the aggregate initially at a rate slightly less than appears optimum so that some binder is visible between the stones. Additional aggregate shall be applied to any bare or insufficiently covered areas as necessary.
4. The additional aggregate shall be applied before the completion of four passes of rubber tyred rolling.
5. Immediately after application of the cover material the surface, shall be rolled with rubber tyred rollers. For the first four passes, rollers shall be operated at speeds less than 7 km per hour. Drag brooming shall be carried out after every second pass of rolling. If the emulsion has not broken and cured or the broom has any tendency to dislodge aggregate, the Contractor shall defer or eliminate the drag brooming. Where drag brooming is eliminated, the Contractor shall substitute light hand brooming.
6. The aggregate application shall be spread within 8 minutes, and the specified number of passes with the roller shall be completed within 15 minutes of the application of the binder. The length of spray runs shall be limited to comply with this requirement. **Timing of Application**
7. All loose aggregate not incorporated in the mat at the completion of rolling and brooming shall be removed from the pavement prior to the application of the binder for the second coat but after the binder has completely broken and cured. The loose aggregate shall be removed in such a manner as to prevent removal of aggregate incorporated in the first coat.

#### **Second Coat (Smaller Aggregate)**

1. The second aggregate coat shall not be applied to the first coat until the binder of the first coat has completely broken and cured to form a stable primerseal leaving no water in the binder.
2. The first coat of aggregate may require to be sprayed with water prior to the application of the binder for the second coat.
3. The second aggregate coat shall be spread and rolled as specified for the first coat. This work shall be completed within 15 minutes of the application of the second binder coat. **Time Lapse between Coats**
4. The new primerseal should not be swept or trafficked until the emulsion has completely broken leaving no water and the binder has had adequate curing to attain full strength, ensuring stone retention after unrestricted trafficking.

### 3.12.114 Surface Sweeping

1. Any loose aggregate not incorporated in the seal mat after the completion of rolling and curing of the second aggregate coat shall be swept off the seal surface without damage to seal or shoulder and shall then be removed from the roadway. Where the roadway to be sealed is kerbed the excess aggregate may be swept hard against the kerb during interim sweeping operations but shall be picked up and removed during the final sweeping.
2. Where the roadway to be sealed is kerbed, the excess cover material shall be picked up by suction broom, without damage to the seal. The excess cover material may be swept hard against the kerb during interim sweeping operation, but shall be picked up and removed by a suction broom to an approved location. **Excess Cover**
3. The initial sweeping shall take place prior to the completion of the days work. A second sweeping shall be carried out at the commencement of the following days work. The Contractor





shall carry out subsequent sweepings as necessary for the following 7 days to ensure that no loose stones remain on the road surface.

4. The Contractor shall install symbolic “loose stones” signs and other temporary traffic management signs in accordance with Section 2 PROVISION FOR TRAFFIC. The signs shall remain in place on each section of the Works for the following 7 days after completion of sealing.  
**Signing**

### 3.12.115 Nonconforming Test Results

1. Where defects arising in a seal or reseal may be in any way, either in part or in full, attributable to bitumen for which test results are non-conforming, then within 60 days of completion of the works on which that bitumen was used, the Superintendent may direct the Contractor to take remedial action to repair or replace any defective sections of work. Any remedial action so directed will be at no cost to the Principal.
2. The Superintendent may refrain from making payment to the Contractor for the Schedule of Rates item for bitumen supply and delivery related to that delivery for 60 days after the work was completed plus any subsequent time thereafter if remedial work is outstanding.
3. The Superintendent may initiate testing of other samples retained but not previously tested.

### 3.12.116 Non-Conformance In Binder Application

1. The actual binder application rate at 15°C on a spray run shall be deemed to be conforming to the ordered binder application rate if it falls within the tolerances given in Table 8.1 for Class 170 Primes and Primerseals, and Table 8.2 for Seals and Bitumen Emulsion Primerseals.
2. Where the actual binder application rate at 15°C on a spray run differs from the ordered rate, the Quality Level shall be deemed to be either non-conformance or one of a range of conditional conformance levels, depending on the difference between the actual binder application rate and the ordered binder application rate. The tolerances applicable to conditional conformance are given in tabular form in Tables 8.1 and 8.2, and a Pay Factor shall be applied for work at the corresponding conformance levels. The Pay Factor applied will reflect the lower level of serviceability of conditionally conforming sprayed bituminous work. **Application**
3. Where sprayed work is deemed non-conforming, the Contractor shall apply corrective action subject to the procedures contained in the Quality System Specification.
4. No payment shall be made for binder sprayed outside the 50mm margin specified in the Sub Section 8.8.4.]

Table 8.3 - Pay Factors for Class 170 Primes & Primerseals



Actual Binder Application Rate (BAR) L/m <sup>2</sup> @ 15°C	Quality Level	Pay Factor (PF)
(OAR - 0.16) or less	Non-Conformance	N/A
(OAR - 0.15) to (OAR - 0.11)	Conditional Conformance Level 3	0.80
(OAR - 0.10) to (OAR + 0.10)	<b>CONFORMANCE</b>	1.00
(OAR + 0.11) to (OAR + 0.15)	Conditional Conformance Level 1	0.95
(OAR + 0.16) to (OAR + 0.20)	Conditional Conformance Level 2	0.85
(OAR + 0.21) to (OAR + 0.25)	Conditional Conformance Level 4	0.70
(OAR + 0.26) or more	Non-Conformance	N/A

(OAR = Ordered Application Rate @ 15°C)

Table 8.4 - Pay Factors For Bituminous Seals & Reseals

Actual Binder Application Rate (BAR) L/m <sup>2</sup> @ 15° (Converted)	11.79.1 Quality Level	Pay Factor (PF)
(OAR - 0.16) or less	Non-Conformance	N/A
(OAR - 0.15) to (OAR - 0.11)	Conditional Conformance Level 2	0.90
(OAR - 0.10) to (OAR + 0.10)	Conformance	1.00
(OAR + 0.11) to (OAR + 0.15)	Conditional Conformance Level 1	0.90
(OAR + 0.16) to (OAR + 0.20)	Conditional Conformance Level 3	0.70
(OAR +0.21) or more	Non-Conformance	N/A

(OAR = Ordered Binder Application Rate at 15°C)

### 11.80 CRUSHED AGGREGATE

1. Conformance of the aggregate at its source shall be construed only as authorising the Contractor to deliver the material. Contamination of the aggregate during cartage, or failure to cart and stockpile the aggregate as specified shall render the material non-conforming. The Contractor shall not be paid for non-conforming material or its cartage.

### 11.81 BITUMINOUS SURFACING

1. In accordance with the "General Directions" of the Preambles to the Schedules of Rates/Bills of Quantities the rates and prices for the respective items shall be the full inclusive value of the work described in the Technical Specification and/or shown on the drawings. **Generally**
2. Prime coats shall be measured in square metres of the plan area. No deduction shall be made for openings each not exceeding one square metre. **Prime Coats**
3. Primerseal coats shall be measured in square metres of the plan area. No deduction shall be made for openings each not exceeding one square metre. **Primerseal Coats**
4. Seal coats shall be measured in square metres of the plan area. No deduction shall be made for openings each not exceeding one square metre. **Seal Coats**



5. Reseal coats shall be measured in square metres of the plan area. No deduction shall be made for openings each not exceeding one square metre. **Reseal Coats**
6. Removal and disposal of existing raised pavement markers shall not be measured or paid separately.
7. Removal, storage and reinstatement of guideposts shall not be measured or paid separately.



## MISCELLANEOUS CONCRETE WORKS

### 11.82 STANDARDS

Conform to the following Standards and Publication unless specified otherwise:

AS 1012	Methods of Testing Concrete.
AS 1141	Methods for Sampling and Testing Aggregates.
AS 1289	Methods of Testing Soils for Engineering Purposes.
AS 1379	The Specification and Manufacture of Concrete.
AS 1478	Chemical Admixtures for Concrete.
AS 2349	Method of Sampling Portland and Blended Cements.
AS 2350	Methods of Testing Portland and Blended Cements.
AS 2758.1	Aggregates and Rock for Engineering Purposes - Concrete Aggregates.
AS 2876	Concrete Kerbs and Channels (Gutters) - Manually or Machine Placed.
AS 3600	Concrete Structures.
AS 3610	Formwork for Concrete.
AS 3972	Portland and Blended Cements.
AS/NZS 4671	Steel Reinforcing Materials

NTTM Materials Testing Manual.

#### 3.12.117 General

This section specifies miscellaneous minor concrete works and does not apply to buildings or bridges.

#### 3.12.118 Materials

Provide manufacturer's test certificates for quality of cement, aggregate and reinforcement.

#### 3.12.119 Cement

Type GP or GB to AS 3972.

Store cement in watertight containers or shelters until used.

Do not mix or store special cement with normal Portland cement.

#### 3.12.120 Fine Aggregate

Clean, hard, tough, durable, uncoated grains, homogeneous in quality, free from clay, dirt and organic material.

#### 3.12.121 Coarse Aggregate

Clean, hard, durable, crushed stone or gravel, free from clay, dirt and organic material.

#### 3.12.122 Water

Clean and free from oil, alkali, organic or other deleterious substances.

#### 3.12.123 Reinforcement - Notice

STANDARD: To AS/NZS 4671

Supply, cut, bend and fix steel reinforcement as specified.



Secure reinforcement and bar supports to prevent displacement during construction and concrete placement.

Notice - Do not place concrete until the reinforcement has been inspected by the Superintendent.

## 11.83 CONCRETE

### 3.12.124 Ready-mix Concrete

Unless otherwise specified, Production Assessment in accordance with AS3600 shall be used.

Register the project with the concrete supplier for submittal of Production Assessment data and nominate the Superintendent for receipt of this information.

Supply concrete with the following properties unless specified otherwise:

Compressive strength: N25

Aggregate size: 20 mm.

Slump: 80 mm, + or - 15 mm.

Conduct slump testing on site for each and every truck.

### 3.12.125 Job-mixed Concrete

Use Project Assessment in accordance with AS 3600.

The Contractor will be responsible for sampling and testing..

Provide concrete with properties as specified for ready-mix concrete.

## 11.84 FOUNDATIONS

Provide a foundation compacted to 90% relative density within 150 mm of the base of concrete.

## 11.85 CONSTRUCTION

### 3.12.126 Formwork - Notice

Design and construct forms so that they are mortar tight and can be removed without damaging the concrete.

Build forms true to line and braced in a substantial and non-yielding manner.

Notice - Do not place concrete until the formwork has been inspected by the Superintendent.

### 3.12.127 Placing of Concrete - Notice - Approval

Notice - Give the Superintendent sufficient notice so that inspection may be made before and during pouring concrete.

Approval - Provide verification that all constituent materials, formwork, falsework, reinforcement, and environmental conditions comply with all requirements. Do not cast any concrete without that verification.

Do not place concrete if the temperature of the concrete exceeds 35 degrees Celsius, or if the ambient air temperature exceeds 40oC.

Place and compact concrete within the following time after the addition of the mixing water to the mix:



MAXIMUM TIME TO PLACE CONCRETE AFTER MIXING	
CONCRETE TEMPERATURE AT TIME OF PLACING	MAXIMUM TIME (minutes)
25 deg. C to 28 deg. C	75
28 deg. C to 32 deg. C	60
32 deg. C to 35 deg. C	45

Place concrete in a continuous operation between construction joints so that the face of the concrete is in a plastic state when succeeding concrete is placed against it.

Do not allow concrete to free-fall from a height greater than 1.5 metres.

Place all concrete in dry weather unless otherwise approved.

For each truck of premixed concrete provide an identification certificate on delivery listing the information required by AS 1379 and any other particular requirements for special class concrete.

### 3.12.128 Jointing

#### **Construction Joints**

Roughen and clean face of hardened concrete before placing fresh concrete against it. Remove soft material, foreign matter and laitance. Thoroughly moisten the joint surface.

#### **Expansion/Contraction Joints**

Joints to be 10 mm wide over full length and filled with a bitumen impregnated fibrous filler.

Provide vertical transverse expansion/contraction joints as follows:

At junctions with other concrete structures

All other works: As shown on the drawings.

#### **Tooled Joints**

Provide tooled joints as follows:

Transverse vertical grooves 20 mm depth minimum.

Joints at right angles to outer edge of concrete works.

All other works: As shown on the drawings.

### 3.12.129 Surface Finishes

Finish surfaces to a smooth and even colour.

Remove free surface water during final screeding of unformed surfaces.

Round off exposed edges and corners.

Protect exposed surfaces from rain until final set has occurred.

Conform to the table CONCRETE FINISHES.

Table - Concrete Finishes



TYPE	DESCRIPTION	APPLICATION
S1	Left rough to give key but not honeycombed or porous	Surfaces to be rendered.
S2	Wood float	As specified.
S3	Steel trowel without polish	Internal surfaces subject to foot traffic. Kerb and gutter.
S4	Wood float and broomed finish - broom finish - broom across direction of traffic	Surfaces subject to vehicular traffic.
S6	Steel float followed by moist hair broom	Surfaces subject to foot traffic.
F1	Remove mortar fins, etc., repair minor blow holes by bagging where approved or rub down with Carborundum stone	Formed surfaces exposed to view.
F2	Off forms	

### 3.12.130 Curing

Protect and cure all exposed surfaces immediately after the concrete has taken its initial set.

Maintain all surfaces, including those within loosened formwork, in a moist condition by:

flooding;

continuous spraying with water; or

other methods approved by the Superintendent.

Prevent staining during the curing process of all concrete surfaces that will be visible in the completed works.

Continuously maintain the protection and curing of each element for the minimum time specified by AS 3600 to provide the concrete with durability corresponding to the specified exposure classification.

Do not use curing compounds in lieu of moist curing unless approved.

### 3.12.131 Backfilling

Backfill areas around the concrete with specified material.

Compact the backfilling in layers not exceeding 150 mm compacted thickness.

Reinstate damaged grassed areas with topsoil and grass seed.

## 11.86 RAIN DAMAGE

Remove and replace rain damaged concrete.

## 11.87 EXISTING SERVICES - APPROVAL

Approval - Obtain the Superintendent's approval before altering the line or level of existing services.

Place an expansion joint between concrete works and service.

## 11.88 CONFORMANCE

Refer to the DRAINAGE WORKS Section for culvert structures and pits.

Conform to the following:

Finished level: + or -15 mm from the specified level.

Invert level: + or -5 mm from the specified level.

Straight edge deviation of surface: 3 mm maximum in 3 m  
6 mm maximum in 15 m.



Alignment: + or -10 mm from the specified alignment.

Chainage at vehicle crossing: + or -150 mm.

Width of vehicle crossing: + or -25 mm.

#### 11.89 DEFECTIVE CONCRETE AND MATERIALS

Concrete which is not placed, cured or finished as specified, does not have the specified strength or other specified properties, is not sound, dense, durable or crack-free will be considered defective.

Bear all cost and delays resulting from the rejection of concrete and subsequent rectification.

Remove the concrete to a point agreed with the Superintendent at which a visually and structurally acceptable construction joint can be made, and the defective element rebuilt.

Repair defective surface finishes if approved by the Superintendent. Approval will not be given if the defective area is too extensive or the techniques proposed are not adequate to ensure a visually acceptable and durable repair.





## DRAINAGE WORKS

### 11.90 STANDARDS

Conform to the following Standards and Publications unless specified otherwise:

AS 1012	Methods of Testing Concrete.
AS 1141	Methods for Sampling and Testing Aggregates.
AS 1289	Methods of Testing Soil for Engineering Purposes.
AS 1379	Specification and Supply of Concrete.
AS 1478	Chemical Admixtures for Concrete.
AS 1597	Precast Reinforced Concrete Box Culverts.
AS 1761	Helical Lock Seam Corrugated Steel Pipes.
AS 1762	Helical Lock Seam Corrugated Steel Pipes - Design and Installation.
AS /NZS 2041	Buried Corrugated Metal Structures.
AS 2349	Method of Sampling Portland and Blended Cements.
AS 2350	Methods of Testing Portland and Blended Cements.
AS 2439	Perforated Plastics Drainage and Effluent Pipe and Fittings.
AS 2758.1	Aggregates and Rock for Engineering Purposes - Concrete Aggregates.
AS 3600	Concrete Structures.
AS 3610	Formwork for Concrete.
AS 3706	Geotextiles - Methods of Test.
AS 3725	Loads on Buried Concrete Pipes.
AS 3972	Portland and Blended Cements.
AS 4058	Precast Concrete Pipes (pressure and non-pressure).
AS/NZS 4671	Steel Reinforcing Materials

AUSTROADS Bridge Code.

### 11.91 DEFINITIONS

<b>CULVERT:</b>	An underground pipe, box or arch constructed in an embankment or trench.
<b>CULVERT SKEW ANGLE:</b>	The angle between a line drawn perpendicular or radial to the road centre line and the centre line of the culvert.
<b>CULVERT CHAINAGE:</b>	The chainage measured along the road centre line at its intersection with the culvert centre line.
<b>LARGE BOX CULVERTS:</b>	Precast box culverts and link slabs having spans greater than 1200 mm, heights greater than 900 mm or fill heights exceeding 1600 mm.

### 11.92 GENERAL

This section applies to the construction of precast concrete pipe culverts not exceeding 1950 mm nominal diameter, precast concrete box culverts and other drainage items.



### 11.93 CLEARING

Clear the site as specified in the PROVISION FOR TRAFFIC Section.

### 11.94 MATERIALS

Conformance testing will be the responsibility of the Contractor.

Ensure that all pipes and box culverts are indelibly marked with an as conformance stamp.

Pipes and box culverts not stamped shall be removed from site at the Contractor's expense.

#### 3.12.132 Precast Reinforced Concrete Pipes

Pipes to be flush joint type with external rubber bands.

Pipes to be clearly marked as to their class.

#### 3.12.133 Precast Reinforced Concrete Box Culverts - Notice - Approval

Use box culverts of the inverted U type suitable for installation on a cast-in-situ concrete slab.

Design and supply box culverts which have a span not greater than 1200 mm, height not more than 900 mm and a fill height not more than 1600 mm in accordance with AS 1597.1.

Design all other box culverts in accordance with AS 1597.2.

Use Standard Vehicle Loadings including Standard Road Train, with addition of the HLP 400 Abnormal Vehicle Loading on all National Highways, and HLP 320 on all other routes.

Provide culverts designed for the appropriate exposure classification.

Approval - Provide drawings showing complete reinforcement and dimensions with tolerances and obtain the Superintendent's approval prior to fabricating any units. Certify that the design is reflected accurately by the shop drawings and that the design is adequate to resist all specified loads and the soil loads pertaining to the site.

Provide a table of construction axle loads versus minimum required cover for each box culvert size.

Notice - Give the Superintendent notice prior to casting concrete.

#### 3.12.134 Corrugated Steel Pipes, Pipe Arches and Arches

Supply in accordance with the details specified.

Assemble in accordance with the manufacturer's instructions.

#### 3.12.135 Bedding

A clean granular material free from sticks, stones and other deleterious material with a Plasticity Index less than 6, conforming to the table MATERIAL SIZE.



Table - Material Size

AS SIEVE (mm)	PERCENTAGE PASSING BY DRY MASS
19.0	100
2.36	50 – 100
0.60	20 – 90
0.30	10 – 60
0.15	0 – 25
0.075	0 – 10

**3.12.136 Concrete**

Conform to the requirements of the MISCELLANEOUS CONCRETE WORKS Section.

**3.12.137 Mortar**

Use one part fresh cement and three parts clean sharp sand mixed with potable water to yield a stiff but workable mixture.

**3.12.138 Select Fill**

Conform to the requirements of the EARTHWORKS Section.

**11.95 CONSTRUCTION OF CULVERTS AND STRUCTURES**

**3.12.139 Setting Out - Approval**

Measure culvert length along the invert to the outside face of headwalls.

Measure pits and/or manholes to the inside face of the wall.

Finished surface levels for kerbside structures are measured at the top of the kerb.

Set out the culvert and / or structure with pegs before construction.

Approval - Obtain the Superintendent's approval for the setting out before construction.

**3.12.140 Excavation - Notice**

Excavate in whatever material encountered.

Use of explosives shall be in accordance with the MISCELLANEOUS PROVISIONS Section.

Pump, bail, sheet, shore and brace as necessary.

Divert water when necessary.

Rectify foundations which are affected by rain or surface water entering the excavation.

The total width of trench at and below the level of the top of the pipe shall be the width of culvert plus 300 mm minimum clearance each side.

Backfill with select fill up to the specified level if the trench is excavated too deep. Any such backfilling shall be at the Contractor's expense.

Notice - Excavate unsuitable material below specified level if directed by the Superintendent.

Replace with select fill, compacted as specified.

**3.12.141 Culverts in Fill under Construction**

Construct fill to 300 mm above the top of culvert, or to subgrade surface if less, prior to construction of culvert. Re-excavate the fill in accordance with the EXCAVATION clause to permit the construction of the culvert.



### 3.12.142 Construction Loading on Culverts

Provide the minimum compacted thickness of cover specified in the table MINIMUM REQUIRED COVER THICKNESS before allowing traffic to cross a culvert.

Do not permit construction vehicles having axle loads greater than 10 tonnes to cross large box culverts under any depth of fill unless specific certification is provided by the culvert crown unit manufacturer that the culverts have been designed to cope with those loads.

Table - Minimum Required Cover Thickness (Metres)

TYPE, SIZE AND CLASS OF CULVERT								
Maximum Construction Vehicle Axle Load (tonne)	CONCRETE PIPES, BY PIPE CLASS						CORRUGATED METAL PIPES	BOXES
	Less than 1200 mm Nominal Diameter		1200 mm Nominal Diameter or more				Internal Diameter or Span up to 3600 mm	Less than 1200 mm Span, 900 Height and 1600 Final Fill Height
CONCRETE PIPE CLASS								
	X(2)	Y(3)	Z(4)	X(2)	Y(3)	Z(4)		
9	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.1
20	0.8	0.6	0.4	0.5	0.4	0.4	1.2	0.6
35	1.3	0.8	0.6	1.3	0.4	0.4	1.5	0.9
50	1.0	0.8		1.0	0.4		1.8	1.2

### 3.12.143 Bedding

Place bedding 75 mm compacted thickness for the full width of the trench or 0.6 m greater than the width of the culvert for non-trench conditions.

Compact bedding to 90% relative compaction.

Shape the bedding to hold pipes in position during compaction of additional fill.

Place and compact a further (haunching) layer of bedding of 150 mm compacted thickness over the full width of the previous layer after the pipe is in position.

[Consider increasing thickness of haunching for large pipe culverts under high fills, to upgrade maximum bedding factor given in Table 5 of AS 3725]

### 3.12.144 Laying Generally

Lay culverts commencing from the downstream end.

End caps, when used, shall provide a tight waterproof seal.

### 3.12.145 Laying Pipe Culverts

Face rebates or sockets upstream.

Rest the full length of the pipe barrel on the bedding.

Position 'TOP' marking on pipes to within 5 degrees of the vertical axis.

Fill all joints with stiff mortar firmly rammed into openings. Remove excess mortar from barrel of culvert. Apply external rubber bands.

Brace pipes of 1200 mm diameter and greater with toms until the completion of the embankment and pavement. The toms shall bear against a sill along the invert and a cap against the crown of the pipe. Provide toms opposite every pipe joint.

Cast collars and blocks in one operation. Restrain the culvert prior to constructing the collars or blocks by partially backfilling with bedding around the barrel of the culvert to one-half of the pipe diameter.

### 3.12.146 Laying Box Culverts

Lay precast box culverts on a cast-in-situ reinforced concrete base slab.

Ensure concrete base slab exceeds external width of box culverts as shown on the typical details.



Butt box culverts firmly together.

Cut away lifting hooks and seal over the affected area with an approved epoxy resin.

Fill all joints with a stiff mortar firmly rammed into the openings. Remove excess mortar from the barrel of the culvert and apply external joint seals, Densopol HT60 or equivalent, 150 mm wide.

### 3.12.147 Connection to Existing Systems

Repair all cut openings and make watertight.

Demolish existing headwalls to make way for the extension of the culvert.

### 3.12.148 Backfill - Notice - Approval

Notice - Notify the Superintendent before backfilling where holes or fissures occur in rock trenches.

Approval - Do not place backfill against any in-situ concrete structure until the concrete has attained 80% characteristic strength and approval has been given.

Place backfill in layers not exceeding 150 mm compacted thickness.

Ensure the maximum difference in height of backfill on each side of a culvert is 300 mm.

Backfill around the culvert for the full width of the trench, and for a minimum 300 mm above the top of the culvert, or to subgrade surface if less, with select fill.

Backfill the remainder of the trench with standard fill.

Stabilise all backfill with 2% cement by mass and compact to 95% relative compaction.

Produce a uniform mix. Complete compaction within one hour of adding mixing water.

Use compaction equipment which will not damage the culvert and in-situ structures.

Stabilise top 150 mm of backfill, for a distance of 1 m adjacent to culvert headwalls and wing walls, so as to be erosion - resistant.

Remove surplus material from the site.

Reinstate to subgrade level trenches cut through pavements and other construction by backfilling the trench with stabilised select fill compacted to 95% relative compaction.

Construct base / sub-base layers of the pavement in accordance with the PAVEMENTS AND SHOULDERS Section.

Reinstate surface.

Reinstate trenches cut outside of pavements and other construction by backfilling with standard fill compacted to 90% relative compaction.

## 11.96 INLET AND OUTLET STRUCTURES AND MAINTENANCE HOLES

Construct in accordance with the specifications.

Compact foundations to 95% relative compaction to a depth of 150 mm minimum.

Replace unsuitable material as specified in the EXCAVATION Clause.

## 11.97 INLET AND OUTLET CHANNELS

Excavate the inlet and outlet of all culverts to facilitate the flow of water.

Conform to the following:

Bed width: Minimum 150 mm greater than overall width of culvert.

Side batters: 45 degrees maximum to horizontal.

Bed grade: 0.5% in the direction of flow for a minimum distance of 50 metres.



### 11.98 OPEN UNLINED DRAINS

Excavate and dispose of all excess material as specified in the EARTHWORKS Section.

Trim drains to form neat levees.

Compact levees to 95% relative compaction.

Allow natural surface runoff.

### 11.99 REMOVAL OF EXISTING CULVERTS AND DRAINAGE STRUCTURES

Demolish and remove from the site, as specified, existing culverts and drainage structures.

### 11.100 SUBSOIL DRAINS

#### 3.12.149 Excavation

##### ***Impervious Material***

Excavate below the top of the impervious zone to a minimum depth equal to the outside diameter of the pipe plus 75 mm.

Place a bedding layer of 50 mm of filter material in the trench and compact with a vibrating plate or similar.

##### ***In Pervious Material***

Excavate and backfill under the pipe with impervious material as specified.

#### 3.12.150 Filter Material

Shall be a hard durable stone having a Los Angeles Abrasion Loss not greater than 35%.

Conform to the grading specified by the manufacturer of the subsoil pipe. If manufacturer's grading not supplied, conform to the table FILTER MATERIAL GRADING.

Table - Filter Material Grading

AS SIEVE (mm)	PERCENTAGE PASSING
37.50	100
19.00	90 – 100
9.50	65 – 85
4.75	45 – 65
0.60	0 – 5

#### 3.12.151 Subsoil Drain Pipe

Use 100 mm diameter Class 400.

Use compatible couplings and fittings.

Connect solid wall pipe to the subsoil drain pipe for the disposal of collected water.

#### 3.12.152 Laying and Backfilling - Approval

Fit the upper end of pipelines with inspection openings and caps supported in a concrete collar.

Approval - Obtain Superintendent's approval of the pipe installation before backfilling.

Place filter material around the barrel of the pipe and to a height of 200 mm above the pipe.

Compact with a vibrating plate compactor or similar.



Place and compact remaining layers of the filter in layers not exceeding 300 mm.

Prevent contamination of the filter.

Place and compact basecourse gravel, as specified in the PAVEMENTS AND SHOULDERS Section in the top 300 mm of trench.

Place the material in two equal layers compacted to 95% relative compaction.

Where trench excavated through pavement compact upper layer of basecourse gravel to 100% relative compaction and reinstate surface.

Backfill above solid wall pipes as specified in the BACKFILL - TRENCH CONDITIONS clause.

### 3.12.153 End Walls

Construct end walls at the outlet of subsoil drains as specified.

Secure 19 mm galvanised wire mesh over the opening.

Mark end walls with guide posts.

### 11.101 CONFORMANCE

Conform to the following:

Invert level and grade line:	No ponding of water.
Open unlined drains:	+ or -50 mm.
Culverts or lined drains:	+ or -20 mm.
Plan position:	+ or -200 mm.
Culverts parallel to kerbs:	+ or -50 mm.
Concrete structure dimension:	+ or -5 mm.
Concrete thickness:	Not less than specified.
Subsoil drain slope:	25 mm maximum sag in 8 m.



## 12 PROTECTION WORKS

### 12.1 STANDARDS

Conform to the following Standards and Publication unless specified otherwise:

AS 1012	Methods of Testing Concrete.
AS 1141	Methods of Sampling and Testing Aggregates.
AS 1289	Methods of Testing Soils for Engineering Purposes.
AS 1725	Galvanized Rail-less Chainwire Security Fences and Gates.
AS 2423	Galvanized Wire Fencing Products.
AS 2758.1	Aggregates and Rock for Engineering Purposes - Concrete Aggregates.
AS 3706	Geotextiles - Methods of Test.
AS 3972	Portland and Blended Cements.
AS 4133	Methods of Testing Rocks for Engineering Purposes.
AS/NZS 4671	Steel Reinforcing Materials
AS /NZS 4680	Hot Dip Galvanized (Zinc) on Coatings Fabricated Ferrous Articles.

### 12.2 FOUNDATIONS

Excavate, fill and trim the site to the required shape prior to commencing the protection works.

Compact the top 150 mm of earthworks, on which protection works are to be laid to 90% relative compaction.

### 12.3 GEOTEXTILE FABRIC

Supply and lay non-woven polypropylene or polyester geotextile fabric having the properties approved by SWEK. Details to be provided to the officer of proposed Geotextiles.

Cut or fold the fabric to the required shape. Patch, repair, or replace damaged fabric.

Cover geotextiles in accordance with the following:

Untreated UV susceptible geotextiles: Within 5 days of placing.

UV treated or low susceptibility geotextiles: Within 30 days of placing.

### 12.4 ROCK PROPERTIES

The rock properties specified in this clause apply to the rock, stone, aggregate and boulders specified in the following clauses in this section;

Stone Pitching

Dumped Rock

Quarter Tonne Dumped Rock

Rubble

Gabion Rock

Reno Mattresses

REQUIREMENTS; Clean, dry, durable crushed stone of uniform quality, free from noxious weeds, vegetable matter and other deleterious materials.





Particles must have at least 2 crushed faces and comply with the following standards;

- AS 1141.25.1 Degradation factor – Source rock (Washington Degradation Test). Basic igneous rocks, eg. Basalt aggregates, shall have a minimum value of 50.
- AS 1141.26 Secondary minerals content in basic igneous rocks, eg. Basalt aggregates, shall not exceed 25%.
- AS 1141.29 Accelerated soundness index by reflux. Basic igneous rocks, eg. Basalt aggregates, shall have a minimum value of 94.

## 12.5 STONE PITCHING

### 3.12.154 Stone Pitching

The stone to be spalls of hard durable rock complying with the ROCK PROPERTIES clause and with no dimension less than 200 mm.

Hand place the stones so that they are firmly bedded in layers.

The average plane of the exposed face to be within 100 mm of the specified plane and all exposed faces of stones to be within 50 mm of the average plane.

### 3.12.155 Grouted Stone Pitching - Approval

Place stones as specified in the STONE PITCHING Clause.

Approval - Obtain Superintendent's approval before grouting.

Grout stone pitching with cement mortar.

Cement mortar to consist of one part cement to three parts of clean sand mixed with potable water to form a workable mixture.

Work the mortar into the interstices of the stone pitching to a depth of at least 100 mm from the surface. Work from the base upwards.

Cure the mortar for at least 48 hours.

Remove defective mortar and regrout any loose stones.

Provide 75 mm diameter weep holes penetrating the full thickness of the grout at the rate of one every 5 square metres.

## 12.6 DUMPED ROCK PROTECTION

Large spalls or boulders complying with the ROCK PROPERTIES clause and having a least dimension of > mm.

[Consider the availability of rock sizes and specify size]

Dump into the specified area.

Protect adjacent areas from damage due to dumping.

The average plane of the exposed rock face to be within 100 mm of the specified position.

## 12.7 QUARTER TONNE CLASS DUMPED ROCK PROTECTION

Large spalls or boulders complying with the ROCK PROPERTIES clause and having the following grading.

ROCK SIZE	MINIMUM % LARGER THAN
35kg	90
250kg	50



500kg 0

[Consider the availability of rock sizes and specify size.]

Dump into the specified area.

Protect adjacent areas from damage due to dumping.

The average plane of the exposed rock face to be within 100 mm of the specified position.

## 12.8 RUBBLE

Broken rock complying with the ROCK PROPERTIES clause.

Maximum size of rubble to be 200 mm.

At least 30% by mass to have a nominal size of 100 mm or greater.

No more than 20% by mass to pass the 2.36 mm sieve.

Dump rubble without segregation onto the prepared area.

Compact rubble to a tight finish.

The average plane of the exposed face to be within 100 mm of that specified.

The exposed face to be within 100 mm of the average plane.

## 12.9 GABIONS

### 3.12.156 General

A flexible, hexagonal woven steel wire mesh box, filled with packed stone, complying with the ROCK PROPERTIES clause and securely laced with steel wire.

### 3.12.157 Steel Wire Mesh

Use galvanized steel wire, Grade W15Z380 to AS 2423.

Zinc coating; 250 g/sq.m Galvanization to be carried out prior to weaving of the mesh.

Minimum tensile strength of wire: 380 MPa

Mesh openings to be 80 mm x 100 mm maximum, hexagonal in shape with flexible joints consisting of not less than two full turns.

All wire to be coated with average thickness of 0.55 mm extruded grey PVC firmly attached to the wire. The minimum thickness of coating to be 0.40 mm in accordance with AS 2423.

[PVC coating can be deleted where abrasion of wire is not likely to be a problem. Additionally PVC coating may be deleted after due consideration of the likely long term deleterious effects on the wire of ground water, soil salinity, natural weather exposure and water immersion]

Conform to the following wire sizes and galvanizing weights:

Table - Wire Properties, Gabions

WIRE TYPE	MINIMUM DIAMETER (mm)
Body wire	2.7
Binding and lacing wire	2.2
Selvedge wire	3.4

Selvedge wire shall be woven integrally along all edges of the mesh, in accordance with the manufacturer's instructions, and such that the mesh shall not unravel.



The steel wire mesh shall be sized so that it can be folded into regular boxes, complete with diaphragms, having dimensions specified. Diaphragms to be at 1,000 mm spacings.

### 3.12.158 Construction

Assemble and erect in accordance with the manufacturer's instructions.

Pretension the wire framework against a firm anchor or adjacent units.

Retain the shape of the wire framework with spreaders.

Fill with hard durable stone, complying with the ROCK PROPERTIES clause and placed in stages to achieve the tightest packing of stone.

Maximum stone dimension: 250 mm.

Minimum stone dimension: 100 mm.

Overfill the framework by 20 mm to 50 mm to allow for subsequent movement of the stone.

Perform lacing operations using specified lacing wire. Wire to pass round the edges being joined using alternative single and double loops through each mesh in turn. Tightness of the mesh and wiring is essential.

Ensure a tightly packed, neat and uniform construction.

## 12.10 RENO MATTRESSES

### 3.12.159 General

A flexible, hexagonal woven steel wire mesh box, filled with packed stone, complying with the ROCK PROPERTIES clause and securely laced with steel wire.

### 3.12.160 Steel Wire Mesh

Use galvanized steel wire, Grade W15Z380 to AS 2423

Zinc coating; 250 g/sq.m Galvanization to be carried out prior to the weaving of the mesh.

Minimum tensile strength of wire: 380 MPa.

Mesh openings to be 60 mm x 80 mm maximum, hexagonal in shape with flexible joints consisting of not less than two full turns.

All wire to be coated with average thickness of 0.55 mm extruded grey PVC firmly attached to the wire. The minimum thickness of coating to be 0.40 mm in accordance with AS 2423.

[PVC coating can be deleted where abrasion of wire is not likely to be a problem. Additionally PVC coating may be deleted after due consideration of the likely long term deleterious effects on the wire of ground water, soil salinity, natural weather exposure and water immersion]

Conform with the following wire sizes and galvanizing weights:

Table - Wire Properties, Reno Mattresses

WIRE TYPE	MINIMUM DIAMETER (mm)
Body wire	2.0
Binding and lacing wire	2.2
Selvedge wire	2.4

Selvedge wire to be woven integrally along all edges of the mesh, in accordance with the manufacturer's instructions.



Cut to shape where necessary.

**Mattress Panels**

Bottom panel: Includes both sides and both end panels.

Top panel: Shall have the same dimension as the bottom, without the sides and ends, and be supplied separately.

Diaphragms: Extend over the full width of the mattress from top to bottom at maximum intervals of 1 m.

**3.12.161 Construction**

Assemble and erect in accordance with the manufacturer's instructions.

Align diaphragms perpendicular to the direction of flow unless otherwise specified.

Pretension the wire framework against a firm anchor or adjacent units.

Retain the shape of the wire framework with spreaders.

Fill with hard durable stone complying with the ROCK PROPERTIES clause and placed in stages to achieve the tightest packing of stone.

Maximum stone dimension:	120 mm when mattress depth 170 mm.
	150 mm when mattress depth 230 mm.
	200 mm when mattress depth 300 mm or greater.
Minimum least stone dimension:	80 mm.

Overfill the framework by 20 mm to 50 mm to allow for subsequent movement of the stone.

Perform lacing operations using specified lacing wire. Wire to pass round the edges being joined using alternative single and double loops through each mesh in turn. Tightness of the mesh and wiring is essential.

Last panel on downstream side, or at base of slope, shall be a whole unit (i.e. not cut).

Ensure a tightly packed, neat and uniform construction.

**12.11 REVETMENT MATTRESSES**

**3.12.162 General**

A nylon fabric material filled with mortar with filter points for the relief of hydrostatic uplift pressure.

Conform to the manufacturer's instructions.

**3.12.163 Materials**

Mortar mix proportions:

CEMENT TYPE GP or GB	FINE SAND	COARSE SAND	WATER
1 (500 kg)	1.2 (600 kg)	2.2 (1,100 kg)	450 l/m <sup>3</sup>

Adjust fine sand/coarse sand proportions if required to provide workable mix.

**3.12.164 Construction**

Toe-in to provide cut-off walls minimum 300 mm deep and width not less than maximum thickness of mattress.

Lay, cut and stitch mattress on prepared surface. Make allowance for take up of fabric resulting from filling mattress with mortar.



All stitching and seams to be neat in appearance and strength to withstand filling pressure.

Ensure mattress is anchored prior to mortar pumping to prevent creep during placement of mortar.

Provide openings in fabric at a maximum of one every 50 m<sup>2</sup> for placement of mortar. Opening to match size of pumping hose.

Make good openings on completion of mortar pumping.

All areas of mattress to be hard filled with mortar with smooth surface.

Do not permit any loading on the mattress until one hour after mortar pumping has been completed.

Remove spilt mortar from surface of mattress by hand only. Do not use water to wash spilt mortar.

Make good any defective areas.

## 12.12 EMBANKMENT PROTECTION - CONCRETE

Construct embankment protection from concrete reinforced with a single layer of centrally located SL62 mesh.

[Delete reinforcing if not required]

Overlap the mesh by 200 mm at joints.

Make construction joints in the vertical plane, at 2 m maximum spacing.

Continue reinforcement mesh across construction joints.

Construct the embankment protection and the margins as an integral unit.

[Delete when there are no margins]

Construct the toe of the embankment protection and the adjacent protection work as an integral unit.

[Delete when there is no adjacent protective work]

Drainage holes to be 75 mm diameter penetrating the full thickness of the protection works. Install the drainage holes at 3 m intervals just above the toe.

Install additional rows of drainage holes parallel to the first, and at 3 m intervals and spacings, where the scope of work requires it.

The exposed surface to be within 50 mm of the specified position.

## 12.13 MARGINS

Construct margins with reinforced concrete. Conforming to the requirements of the MISCELLANEOUS CONCRETE WORKS Section.

Make construction joints at 3 m maximum spacing.

Form the top 75 mm of the vertical face nearer the pavement, and any exposed outer face, true to line and level.

Wood float and broom finish the upper surface of the margin. Finish flush with the top of the pavement.

Overlap the bituminous seal on the margins by not less than 100 mm.

### **Tolerances**

Width: Not less than specified.

Level: + or - 10 mm of top of adjacent pavement.



## ROAD FURNITURE AND TRAFFIC CONTROL DEVICES

### 12.14 STANDARDS

Conform to the following Standards and Publication unless specified otherwise:

- AS 1012 Methods of Testing Concrete.
- AS 1074 Steel Tubes and Tubulars for Ordinary Services.
- AS /NZS 1111 ISO Metric Hexagon Commercial Bolts and Screws.
- AS /NZS 1112 ISO Metric Hexagon Nuts, Including Thin Nuts, Slotted Nuts and Castle Nuts.
- AS 1273 Unplasticised PVC (UPVC) Downpipe and Fittings for Rainwater.
- AS 1397 Steel Sheet and Strip Hot Dipped Zinc Coated or Aluminium/Zinc Coated.
- AS /NZS 1554 Structural Steel Welding.
- AS /NZS 1580 Paints and Related Materials - Methods of Test.
- AS /NZS 1594 Hot Rolled Steel Flat Products.
- AS 1604 Timber – Preservative Treated – Sawn and Round.
- AS 1722 Pipe Threads of Whitworth Form.
- AS 1725 Galvanized Rail-less Chainwire Security Fences and Gates.
- AS /NZS 1734 Aluminium and Aluminium Alloys - Flat Sheet, Coiled Sheet and Plate.
- AS 1742 Manual of Uniform Traffic Control Devices.
- AS 1743 Road Signs - Specifications.
- AS 1744 Forms of Letters and Numerals for Road Signs.
- AS /NZS 1906 Retroreflective Materials and Devices for Road Traffic Control Purposes.
- AS 2009 Glass Beads for Road Marking Materials.
- AS 2423 Galvanized Wire Fencing Products.
- AS /NZS 2433 Plastics - Method for Exposure to Ultraviolet Lamps.
- AS 2700 Colour Standards for General Purposes.
- AS 3730.14 Guide to Properties of Paints for Buildings - Undercoat - Solvent Borne - Exterior/Interior.
- AS 4025.1 Paints for Equipment Including Ships - Solvent - Borne - Interior and Exterior - Full Gloss Enamel.
- AS 4049.2 Paints and Related Materials -Thermoplastic Road Marking Materials.
- AS/NZS 4049.3 Paints and Related Materials - Road Marking Materials - Waterborne Paint - For use with Drop on Beads.
- AS/NZS 4680 Hot Dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles.
- APAS 0041/4 Road Marking Paint, Thermoplastic.
- APAS 0041/5 Road Marking Paint, Water Borne.
- NTTM Materials Testing Manual.

### 12.15 DEFINITIONS

**TRAFFIC CONTROL DEVICE:** Any sign, signal, pavement marking or other installation placed or erected for the purpose of regulating, warning, guiding or providing for



the safety of road users. It does not include temporary warning devices and control measures erected only for the construction period.

- LONGITUDINAL LINES:** Any line which runs parallel to the road centre line, e.g. broken line, edge line, separation line, barrier line.
- TRANSVERSE MARKINGS:** Any line which is at right angles to the centre line of the road, e.g. stop line, hold line, pedestrian cross walk
- OTHER MARKINGS:** All diagonal lines, chevron markings and messages on the pavement, including symbols, words, numerals, arrows and kerb markings.

## 12.16 FENCING

### 3.12.165 General

Clearing fence lines includes the removal of trees, shrubs, vegetable matter and debris. Grub out all roots that interfere with the placement of posts.

Erect fences so that the line of the tops of the posts is uniform.

Adjust the position of posts to compensate for the irregularities of the ground.

Provide gates where specified and across existing access tracks or roads.

### 3.12.166 Existing Fences

Install a post at the intersection of new fence with existing fence and fix the wiring of both fences to that post.

Complete the necessary sections of new fencing before removing or opening a boundary or internal fence.

Notify the occupier in writing of the date the fence will be removed.

Erect gates or grids at fence openings as specified.

### 3.12.167 Materials

Barbed wire: 1.57 mm diameter minimum, high tensile.

Plain wire: 2.50 mm diameter minimum, high tensile.

Wire mesh: Galvanized 3.15 mm diameter x 50 mm chain mesh.

### 3.12.168 Stock Fence

Stock fencing to consist of tubular steel strainer assemblies with star pickets and galvanized wire. Construct as specified.

Include the crossing of gullies, watercourses and hollows on the ground.

### 3.12.169 Security Fence

Security fencing to consist of tubular steel posts complete with post caps, cable straining wires, chainwire mesh and three barbed wires. Construct as specified.

### 3.12.170 Safety Fence

Safety fence to consist of "HUMEARC" type SWP HRI x 3 m panels or similar.

Erect the fence in accordance with manufacturer's specifications.

### 3.12.171 Log Barrier Fence

Provide log barrier fencing consisting of timber posts and rails complete with connections. Construct as shown in the typical details.



Use stringybark, woollybutt or pine timber, pressure impregnated with ACQ preservative formulation, copper oxide (CuO) and quaternary ammonium compound (DDAC) to Category H4 of AS 1604.

Do not use preservative treatments that contain arsenic or chromium.

## 12.17 GUIDE POSTS

### 3.12.172 Posts

Use THERMOPLASTIC guide posts manufactured from plastic alloy ASA/PC or similar.

#### **Requirements**

Posts to conform to the following:

- Colour: Opaque white.
- Finish: Smooth, glossy.
- Length: 1380 mm.
- Width: 95 mm minimum, 105 mm maximum, width to be constant to within 1 mm.
- Web thickness: 3 mm minimum, 5 mm maximum.

Provide certification that guide posts conform to the following:

- Where installed in normal working conditions, guide posts are capable of self erecting after 10 impacts head on, from an average sedan travelling at 60 kilometres per hour.
- After 2,000 hours of exposure in an Atlas Weatherometer the guide posts do not change colour by more than 10 points on a Delta E colour chart.
- The guide post material has a minimum vicat softening point of 120 degrees C.
- Physical testing as specified.
- Resistant to termites.

Guide posts to have the following:

- An anti-withdrawal device which will prevent the guide post from being withdrawn without dislodgement of the compacted backfill.
- Legible and indelible markings similar to those used to mark UPVC sewer and water pipes, in letters no less than 5 mm high, showing month and year of manufacture and located approximately 400 mm from the top of the post.
- Legible and indelible marking 300 mm from the bottom of the guide post, to indicate depth for installation.

### 3.12.173 Delineators

#### **Rectangular Retroreflectors**

Class 1 retroreflective material.

Size to be 100 mm x 50 mm minimum for red delineators; 100 mm x 25 mm minimum for white delineators.

#### **Corner Cube Retroreflectors**

Minimum face area for red and white delineators to be 4,400 square millimetres.

### 3.12.174 Installation

Attach one red and one white delineator to each guide post, 50 mm from the top of the post.

The red delineator to be attached to the convex side of curved guide posts where applicable.

Attach any corner cube delineators required as specified.





Red delineators to be on the left and white delineators to be on the right when viewed in the direction of travel.

## 12.18 ROAD SIGNS

### 3.12.175 General

This subsection specifies the manufacture, supply, delivery and erection of road signs.

### 3.12.176 Materials

#### **Non-Reflective Materials**

In accordance with AS 1743 Appendix B.

#### **Reflective Material**

Use high intensity Class 1 standard in accordance with AS 1743 Appendix C for all signs, including temporary signs, and hazard markers with the exception that all black legends are to be non-reflective.

#### **Blanks**

Use aluminium marine grade alloy designation 5251 - H38. Thickness 1.6 mm.

Steel sheets may only be used for temporary signs.

#### **Manufacture**

Chemically clean aluminium blanks before painting or bonding of reflective material.

Stamp the month and year of manufacture and the symbol DIPE on the backs of all signs.

#### **Posts**

Post sizes to conform to the table ROADSIDE SIGNS - MOUNTING SELECTION unless specified otherwise.

Posts to be medium grade galvanized pipe with plain ends and constructed from a single length of pipe. Cap each post with a galvanized cap.

OR

Posts to be galvanized shaped section - "INGAL" or similar in single length or back to back configuration.

### 3.12.177 Supply and Delivery

Supply all brackets, bolts, nuts and bracings.

Fix bracings to the signs prior to delivery.

### 3.12.178 Location

Signs to be located clear of vegetation and be clearly visible under headlight illumination.

#### **Lateral Placement**

Lateral placement to be measured to the edge of the sign nearest the road.

Lateral placement to be as follows:

Unkerbed roads: 2 to 4 m clear from the edge of the traffic lane, and 600 mm minimum clear from the outer edge of the road shoulder.

Kerbed roads: 500 mm to 1000 mm from the front face of the kerb.

#### **Height**

Height to be measured as the clearance to the lowest edge of the lowest sign in an assembly.

Heights for signs to be as follows:

Unkerbed Roads



Fingerboard (G3) and street name signs (G5):	2 m above the near edge of the pavement.
Other signs: Kerbed Roads	1 m to 1.5 m above the near edge of the pavement.
Signs overhanging a footway:	2.5 m minimum above footway.
Signs not overhanging a footway:	1 m to 1.5 m clearance except for those specific signs on medians and islands given below.
Specific signs on medians and islands:	The following signs, when used on medians and islands, to have a clearance 150 mm above the kerb:
D4-1-2 Hazard Marker	
D4-2-2 Hazard Marker	
D4-3 Hazard Marker	
R2-3 (Keep Left) (Keep Right)	
R2-5 (No U Turn)	
R2-6 (No Right Turn) (No Left Turn)	
R2-15 (U Turn Permitted).	

### 3.12.179 Installation

Conform to the table ROADSIDE SIGNS - MOUNTING SELECTION.

Posts to be vertical.

Sleeves, when specified, to be 50 mm longer than the specified ground anchor depth and extend 50 mm above the finished surface level.

Attach the post to the sleeve with a galvanized M10 bolt, 25 mm from the top of the sleeve. Encase the post, or sleeve when used, in a footing of 20 MPa concrete.

Orientation of sign face: Vertical, and turned 3 degrees to 5 degrees horizontally from oncoming traffic on straight sections. On curves, at right angles to centre line of road.

Exception: Parking signs to be oriented 5 degrees from parallel to the kerb to face oncoming traffic.

### 3.12.180 Reinstatement and Relocation of Existing Signs

Dismantle existing post and signs carefully.

Store in a manner to prevent damage.

Backfill the hole left by the post and its footing and compact the fill to the same density as the surrounding area.

Erect signs in new locations as shown on the drawings.

#### Table - Roadside Signs - Mounting Selection

TECHNICAL SPECIFICATION FOR RURAL ROADS  
ROAD FURNITURE AND TRAFFIC CONTROL DEVICES



SIGN SIZE W X D	NO. AND NB GAL. PIPE POSTS	INGAL NO. SINGLE OR DOUBLE	SIGN ATTACHMENT BRACKETS (OR M8 BOLTS) PER POST	BRACING	ANCHOR DEPTH (mm)	ANCHOR DIA. (mm)
300 x 300	1 x 50	1 x S	2	No	600	300
300 x 450	"	"	"	"	"	"
450 x 450	"	"	"	"	"	"
450 x 300	"	"	"	"	"	"
450 x 600	"	"	"	"	"	"
450 x 750	"	1 x D	"	"	"	"
450 x 900	"	"	"	"	"	"
600 x 450	"	1 x S	"	"	"	"
600 x 600	"	1 x D	"	"	"	"
600 x 750	"	"	"	"	"	"
600 x 900	"	"	3	"	"	"
600 x 1050	"	"	3	"	"	"
750 x 450	"	"	2	"	"	"
750 x 600	"	"	2	"	"	"
750 x 750	"	"	2	"	"	"
750 x 1200	"	"	3	"	1000	"
900 x 300	"	1 x S	2	Yes	600	"
900 x 600	"	1 x D	2	"	"	"
900 x 900	"	"	3	"	"	"
900 x 1350	"	"	4	"	1000	"
1050 x 600	"	"	2	"	"	"
1050 x 900	"	"	3	"	"	"
1200 x 600	2 x 50	2 x D	2	"	600	"
1800 x 600	2 x 50	"	2	"	1000	"
1800 x 1200	2 x 80	3 x D	4	"	"	"
2400 x 1200	2 x 80	"	4	"	1200	450
2400 x 1800	2 x 100	N/S	5	"	"	"
3000 x 600	2 x 50	2 x D	2	"	1000	300
3000 x 1200	2 x 80	N/S	4	"	1200	450
3000 x 1800	2 x 100	"	5	"	1500	"
3700 x 600	2 x 80	3 x D	2	"	1000	300
3700 x 1200	3 x 80	N/S	4	"	1200	450
3700 x 1800	3 x 100	"	5	"	1500	"
3700 x 2400	4 x 100	"	7	"	1500	"
4300 x 600	2 x 80	"	2	"	1000	300
4300 x 1200	3 x 80	"	4	"	1200	450
4300 x 1800	3 x 100	"	5	"	1500	"
4900 x 600	3 x 80	"	2	"	1000	300
4900 x 1200	3 x 100	"	4	"	1200	450
4900 x 1800	3 x 100	"	5	"	1500	"
5500 x 600	3 x 80	"	2	"	1000	300
5500 x 1200	3 x 100	"	4	"	1200	450
5500 x 1800	4 x 100	"	5	"	1500	"
6100 x 600	3 x 80	"	2	"	1000	300
6100 x 1200	3 x 100	"	4	"	1200	450
6100 x 1800	4 x 100	"	5	"	1500	"



### General Requirements

- Spacing between posts to be:
  - 2 post signs - 0.6 times sign width.
  - 3 post signs - 0.4 times sign width.
  - 4 post signs - 0.3 times sign width.
- Brace spacing to be 380 mm maximum.
- Adopt the nearest size in the list for intermediate sizes.
- Post sizes for galvanized pipe posts are for sign clearance of less than 2 m above the pavement. For sign clearances greater than 2 m, increase the nominal diameter of the pipe size by a percentage equal to the percentage increase in height above 2 m.
- Where signs are erected in groups treat the overall dimensions of the group as one sign size to determine the post requirement from the table GENERAL REQUIREMENTS.

## 12.19 PAVEMENT MARKING

### 3.12.181 General

This section specifies the materials, testing and standards of workmanship for marking of pavements with road marking paint and/or thermoplastic material, including glass beads.

### 3.12.182 Road Marking Paint - Notice

Road marking paint: Approved water based white road marking paint conforming to APAS 0041/5 and suitable for application by spray equipment in accordance with Test Method AS/NZS 1580.205.4 to asphalt and bituminous seal road surfaces and for use with Intermix drop-on spherical glass beads.

Australian Paint Approvals Scheme (APAS) Specifications: For paint types identified by an APAS specification code, conform to the specification represented by that code.

Notice - Submit a 'Certificate of Compliance' of the paint with the relevant Australian Standards or APAS specification.

### 3.12.183 Long Life Marking Materials - Notice

Material: Thermoplastic cold applied resin or cement based product approved and recommended by the manufacturer for the purpose and conforming to the requirements of AS 4049.2 and APAS specification 0041/4.

Notice - Submit a 'Certificate of Compliance' of the material with the relevant Australian Standards or APAS specification.

### 3.12.184 Glass Beads

Use Intermix glass beads conforming to AS 2009 with the exception of size, and conforming to the following size distribution requirements:

SIEVE SIZE (Microns)	% RETAINED	% PASSING
1180	0 – 3	97 – 100
850	5 – 20	80 - 95
425	65 – 95	5 – 35
PAN	010	

### 3.12.185 Setting Out

New work: Set out line marking to the line pattern specified in accordance with the standard drawing for LINE MARKING, C(S) 1520 and in accordance with AS 1742 including the setting out of arrows, letters, numerals and chevrons.



Remarking: Remark along the line of the existing line marking and to the tolerances specified for new work.

### 3.12.186 Application - Notice - Approval

Approval - Equipment: Apply the marking materials using a self-propelled mobile sprayer, hand sprayer, hand painting or hand screeding as directed by the Superintendent.

Maximum application speed for Intermix glass beads is 12 km/hr.

Apply glass beads by low pressure or delivered by gravity dispenser.

The application rates specified for glass beads are the rates that shall be retained in the painted surface after 3 weeks of trafficking.

Produce markings free from ghosting and raggedness on the sides and ends and parallel with the general alignment of the carriageway with the lines level, uniform and free from streaks.

Substrate: Ensure that the road surface is free from dirt, loose detritus, mud and other extraneous matter, and is dry before and after painting operations.

Table - Application Rates

Material	Longitudinal Markings	Transverse and Other Markings
Water borne Paint dry film thickness (excluding surface applied beads)	> 0.250 mm	> 0.250 mm
Water borne Paint wet film thickness (excluding surface applied beads)	> 0.400 mm	> 0.400 mm
Surface applied glass beads (rate retained in the paint surface)	Intermix glass beads > 300g/m <sup>2</sup>	Intermix glass beads > 300g/m <sup>2</sup>
Thermoplastic cold film thickness	> 1.5 mm	3.0 mm + 1.0 mm
Surface applied glass beads (rate retained in the painted surface)	Intermix glass beads > 300g/m <sup>2</sup>	Intermix glass beads > 300g/m <sup>2</sup>

### 3.12.187 Longitudinal Application

Apply paint evenly to the road surface at the specified film thicknesses (Tolerance + 0.05 mm) and not more than five seconds after spraying apply the intermix glass beads. The loss in glass beads after three weeks traffic shall not exceed ten per cent of total applied.

On all work, apply one coat of paint and glass beads to the road in the direction of traffic flow, where possible.

For remarking apply one coat of paint and glass beads to the surface in the direction of traffic flow, where possible.

Transverse and Other Marking Applications: Apply paint evenly to the road surface to the specified film thickness and immediately after apply an even application of 'drop-on' glass beads at the specified rates.

### 3.12.188 Tolerance

Ensure the distance between the centre line of the marking and the centre line of the set out mark is less than 30 mm. The apparent line of the markings is a smooth continuous alignment when viewed in the direction of the line. Permitted tolerance for the length, width and spacing of all pavement markings: +/- 10 mm.

### 3.12.189 Workmanship – Approval

Set out markings so that they are straight, with smooth even curves where necessary. Remove any marking material beyond the defined marking leaving a neat and smooth marking on the pavement.



Approval - Remove defective marking by sand blasting, or other approved methods, make good the surface in a manner approved by the Superintendent.

Protect all applications from traffic until the binder has hardened sufficiently to retain the glass beads.

Reinstate pavement markings that are damaged by traffic during paint drying time and remove all tyre pickup marks.

### 3.12.190 Removal of Existing Markings

Remove existing unnecessary line marking by sand blasting or other methods approved by the Superintendent.

Ensure sand blasting is carried out in a safe manner and clean up any residue.

### 3.12.191 Field Testing

Wet film thickness: Check the thickness of the wet film applied to the road pavement by the method of procedure for Operation of Wet Film Thickness Comb (WA 813.1).

Glass bead application: Check the application rate of glass beads to the surface of the marked line by the method of Field Procedure for Measurement of the Rate of Application of Spherical Glass Beads (AS 2341).

Wear assessment limits: The degree of wear is defined as the area of pavement marking remaining after a period of time, relative to the initial area of the pavement marking.

Degree of wear: At the Superintendent's discretion determine the degree of wear using Image Analysis in accordance with the Department of Road Transport South Australia test method DRT-MAT-TP904 Pavement Marking.

Wear limits for pavement marking: 95% intact area after six months.

Remark pavement marking that does not conform to the specified limits at the Contractor's expense including the costs of all testing.

## 12.20 PAVEMENT MARKING - RESEALING CONTRACTS

Conform to the following requirements for resealing work including enrichments, spray sealing, rejuvenation and emulsion coats.

Conform to the requirements of the PAVEMENT MARKING clauses.

### 3.12.192 Co-ordination of Pavement Marking Work

The Contractor is responsible for co-ordination of the pavement marking work.

Make all arrangements necessary with the pavement marking Contractor to meet the following requirements:

- For urban work, complete the pavement marking within two days of resealing work.
- For rural work, complete the pavement marking within four days of resealing work.

Retain all traffic control and warning devices necessary until pavement marking is completed.

Record all localities and extent of pavement marking to reinstate to existing arrangements. Provide this information to the panel contract line marker and co-ordinate all pavement marking works.

## 12.21 RAISED RETROREFLECTIVE PAVEMENT MARKERS (RRPMS)

### 3.12.193 Materials

Use STIMSONITE 953 markers fixed to the road surface as recommended by the manufacturer of the marker.

Use adhesives as recommended by the manufacturer.

Use adhesives within the time recommended by the adhesive manufacturer.



### 3.12.194 Pavement Preparation

Ensure each RRPM site is free of dirt, oil, grease, paint and any other material which would affect the bond of adhesive to the pavement.

Abrasive blast, chip, or burn pavements that cannot be cleaned by sweeping.

Check the moisture content of the surface immediately before application by the polyethylene film moisture test.

Do not place markers if the film moisture test indicates the presence of moisture.

### 3.12.195 Placing Markers

Place markers in accordance with the manufacturer's directions.

Use marker types as follows:

Centre line: White, two way reflectors.

Lane line: White, one way reflectors.

Left edge line: Red, one way reflectors.

Right edge line adjacent to medians on dual carriageway.

Roads: Yellow, one way reflectors.

Place the reflectors to face the oncoming traffic.

Do not obscure the reflective faces by adhesive.

Surface finish to be smooth.

Discard markers which are not positioned correctly within the time recommended by the manufacturer for use of the adhesive. Remove adhesive from the road surface.

Do not place markers over joints in concrete pavement.

## 12.22 FLOOD GAUGE POSTS

### 3.12.196 Posts and Gauges

Use a standard flood gauge.

Use galvanized posts, either single length medium grade 50 mm nominal bore with plain ends and end cap, or single length "Ingal" section.

### 3.12.197 Installation

Erect the post vertically at the outer edge of the road shoulder or margin, on the left hand side when viewed in the direction of travel.

Install a concrete anchor, of 20 MPa concrete, with a depth of 600 mm and a diameter of 300 mm.

Cast a suitable galvanized sleeve, 650 mm in length, in the anchor so that the sleeve extends 50 mm above the finished surface level.

Attach post to sleeve with a galvanized M10 bolt 25 mm from the top of the sleeve.

Secure gauge to post with galvanized bolts and nuts, and galvanized brackets as appropriate.

Position gauge zero to comply with lowest spot on floodway along the centre line.

## 12.23 CATTLE GRIDS

Construct grids to the details shown on the drawings.

[Ensure standard drawing C(S) 1315 is included]



- Place the grid centre line on the centre line of the road pavement.
- The grid grade and levels to conform to the grade and levels of the adjacent road pavement.
- Place and compact select fill behind the abutments of the grid, up to the base of the pavement.
- Reinstate pavement layers with base material.
- Reinstate surface.
- Tighten all hold down bolts as specified.
- Paint the portion of guardrails above ground with one coat zinc phosphate primer and two coats of white alkyd paint.
- Fix width markers with epoxy adhesive to each guardrail.
- Construct strainer post assemblies as specified.
- Fix the stock fence to the strainer assembly.
- Supply and install a gate in the fencing adjacent to the grid as specified.

## 12.24 STEEL BEAM GUARDRAIL

### 3.12.198 Materials

#### **Rails**

Use W-beam guardrail similar to 'Armco Flex Beam Guardrail' (nominal 300 mm width) or similar formed from HA 350 steel.

Rails to be capable of withstanding a cold bend of 180 deg. around a diameter 2.5 times its own thickness without cracking.

Metal thickness to be 2.7 mm minimum.

#### **Terminal Sections**

Form from HA 350 steel having the same properties and thickness as the rails.

#### **Posts**

Fabricate posts and block outs from steel channel section in accordance with standard drawing C(S) 1310.

#### **Bolts And Nuts**

Shape bolt shoulders and holes in rail elements to prevent the bolts from turning.

Length of bolts to be sufficient to extend 6 mm to 12 mm beyond the nuts.

#### **Galvanizing**

Galvanize all components by hot dip galvanizing, after fabrication, to AS 4680.

Repair defective galvanizing observed by painting with a zinc rich paint of similar colour.

### 3.12.199 Installation

Erect the rail in a manner that produces a smooth, continuous, taut rail closely conforming to the line and grade of the roadway.

Lap rails so that the ends of rails do not face oncoming traffic in the adjacent lane.

Attach reflective delineators to the guardrail in accordance with the manufacturer's specification.





## STORMWATER DRAINAGE

### 12.25 GENERAL

Stormwater drainage shall be setout and constructed as specified, in the Technical Specification and Standard Drawings.

Access to all drainage structures and pits shall be in accordance with Occupational Health and Safety requirements.

Drainage pipes are to be Reinforced Concrete (RCP) or Fibre Reinforced Cement (FRC).

RCP or FRC drainage pipes only are to be used in road reserves, drainage easements and SWEK owned or controlled public spaces.

Corrugated steel, plastic, or locally manufactured un-reinforced concrete pipes may only be used with approval by the Officer.

Subsoil drainage pipes shall conform to the above, except in the case of reinforced concrete pipes, and shall have 250mmx5mm slots cut through the pipe on alternate sides at 100° so that the total length of slots is approximately half the total length of pipe.

### 12.26 REINFORCED CONCRETE AND FIBRE REINFORCED CEMENT PIPES

Reinforced concrete and Fibre Reinforced Cement pipes shall be flush jointed type with external rubber bands or spigot and socket with rubber ring type joint, unless otherwise approved.

Pipes laid on filled ground with questionable bearing characteristics shall be rubber ring jointed only.

Strength class for RCP's and FRC's shall be class 2 or better, unless otherwise approved.

All concrete pipes shall be clearly stamped as to their class. Any pipes not clearly stamped may be rejected.

The Consultant shall make adequate allowances for concrete pipes laid in salt water environments or at levels below RL 3.95 AHD.

#### 3.12.200 Reinforced Concrete Box Culverts

Box culverts shall be U type suitable for installation on a cast insitu concrete slab. Precast culverts up to a size of 120mm x 900mm shall be in accordance with AS1597. All others shall conform to AS1597.2.

#### 3.12.201 Corrugated Steel Pipes

Corrugated steel pipes shall be supplied and installed in accordance with the manufacturers specification.

#### 3.12.202 Locally Manufactured Un-reinforced Concrete Pipes

Locally manufactured Un-reinforced Concrete Pipes shall only be used where appropriate testing and certification to Australian standards has been provided to and approved by the Officer. Such pipes will be spigot and socket with rubber ring.

#### 3.12.203 Junction and Side Entry Pits

Junction pits shall be constructed from either precast concrete or cast insitu as determined by the Technical Specification and in accordance with the Approved or Standard Drawings, Alternatives will be considered by the Officer. No alternatives may be constructed without approval of the Officer.

All junction pit covers shall be flush with either the pavement level or the finish ground level and set at the appropriate crossfalls where necessary.

Access to all Junction pits and Gully pits is to comply with the requirements of Occupational Health and Safety requirements.

All pits to have sub soil drainage holes cast into the bottoms on the upstream sides at the lowest level.



### 3.12.204 Headwalls

Where a piped drain interfaces with an open drain, a suitable headwall structure shall be constructed in accordance with the Standard Drawings. The type of structure shall be approved by the Officer.

In the case of pipes exceeding 600mm diameter, suitable structures shall be fitted to the inlet of the pipe drainage system to prevent access.

The foundation of all headwall structures shall have a compaction to 95% MMDD to a depth of 150mm.

### 3.12.205 Excavation

Trenches shall be excavated to the line, depth and gradient required and as detailed and specified.

If any pipe trench is over excavated, the extra depth shall be filled with approved material and compacted to a density of not less than that of the surrounding ground.

The width of the trench shall be a minimum of 150 mm each side of the extremities of the pipe and in accordance with the Standard Drawings.

Excavation in rock or hard soil that may be carried out by blasting shall be in accordance with the Technical Specification.

Any excavations which are carried out on existing public or private roads shall be arranged so that pedestrian and vehicular access is maintained at all times. If the work requires the closure of a road, the written approval of the Officer shall be obtained.

The excavation of trenches with irregular shaped sides shall be avoided, and where there is any danger of a trench collapse, then approved shoring shall be placed. If a trench is located within 2 m of a building or load bearing structure, then approved shoring shall be placed.

All Shoring shall be in accordance with Occupational Health and Safety requirements.

Free water in excavations shall be controlled sufficiently to not interfere with construction operations.

No bedding material shall be placed until the trench excavation has been inspected and approved in accordance with the agreed inspection program.

### 3.12.206 Sub Soil Drainage

Subsoil drainage will be required to all road pavement and drainage structures unless the Consultant can provide sufficient evidence that it is not required. Sub soil drainage shall be placed generally in accordance with the Standard Drawings.

Sub soil drainage shall be slotted pipe, strip drain or other approved subsoil drainage pipe with non-woven polypropylene or polyester geotextile fabric.

All drainage trenches to drain to drainage pits via sub grade drainage holes placed on the upstream face of the drainage pits at the lowest possible level.

### 3.12.207 Trench Backfilling & Reinstatement

No backfilling of pipelines shall occur until they have been jointly inspected and approved by the Officer, Superintendent and the Contractor.

All backfilling shall be placed in such a way that no pipes or joints or other works are displaced or damaged. The backfilled material in the pipe trench shall be thoroughly rammed and compacted in layers of specified thickness using appropriate equipment. The required compaction is to be as specified or if not specified, that of the adjacent in-situ material.

Where cavities are found in the base or walls of trenches, the Superintendent shall inform the Officer, who will approve the remedial measures to be taken as stated in Section 4.2.10.

Backfill material for trenches located under roads and parallel to and close to kerbs and other structures shall be Class 3 minimum gravel or FCR. Backfill is to be placed from the top of the filter layer to the pavement level in layers not exceeding 200mm and compacted to not less than 95% MDD when tested in accordance with AS 1289.



### 3.12.208 Open Drains

Open drains shall be installed to the lines and levels shown on the approved drawings.

Excavated material from open drains shall be disposed of in an approved manner.

Where over-excavation occurs, this shall be corrected by filling with best excavated material and compacting to a density exceeding that of the natural surrounding material or with stabilised material as directed by the Officer.

### 3.12.209 Stone Pitching

Where indicated on the drawings, surfaces shall be protected by hand placed pitching stones. Stones shall be hard, sound and durable and generally weigh in excess of 10kg each. The greatest dimension of any stone shall not exceed 1.5 times its least dimension.

Stones shall be set on a sand bed in a close fitting pattern, watered and rammed into position.

Where specified as mortared stone pitching, the joints between stones shall be raked for their full depth and grouted with 3 parts sand to one part Portland Cement mortar.



## IRRIGATION FOR LANDSCAPING

### 12.27 GENERAL

The alignment and level of existing services are to be confirmed prior to the commencement of irrigation works. Any damage to existing services or fixtures shall be rectified at the Developer's expense. All works shall be in accordance with AS 3500.1, unless specified otherwise. Approval from the Water Corporation, shall be obtained prior to connection of water supply.

Sufficient water pressure and volume is to be made available to operate the system prior to commencement of works.

It is the Developers responsibility to ensure all work by Contractors and subcontractors is fully supervised, and that the Officer is notified of progress. Non-compliance with Shire of Wyndham East Kimberley specifications may prevent or delay certification. SWEK is to be notified if problems arise. At no stage are specifications to be compromised.

### 12.28 INSPECTIONS

24 hours notice is to be given to the Officer for inspection of Irrigation works. The works to be inspected by the Officer are as follows:

- The site prior to commencement of works
- Pipe work and valves prior to commencement of works
- Hydrostatic testing
- Practical completion / Handover

The works shall be prepared for testing by securely anchoring all pipe work and fittings to ensure no movement during testing and any items not designed to withstand test pressures are sealed off. The pipe work is to be tested with water at 960 KPa for 2 hours. All pipe joints, valve seats, strainers and other elements are to be tested for leaks.

### 12.29 METER INSTALLATION, PAYMENT OF COSTS AND HANDOVER TO SWEK

The Developer is to be responsible for all costs associated with the installation of tappings, water meters and irrigation over the establishment and maintenance periods.

When then the works are accepted Off Maintenance by SWEK, the developer is to organise the transfer of the meter from the developer's name to SWEK's and also provide to SWEK the particular meter identification number, service location, water meter number and meter size.

#### 3.12.210 Installation

All tubes and pipes are to be installed having grade of class identification marking so that the marking is visible for inspection, and all pipe work under paths, paving or slabs are laid in conduits:

- All pipe work is to be installed in straight lines and uniform grades.
- Provide unions, flanges and isolating valves for the satisfactory removal of piping and fittings for maintenance or replacement of plant.
- Arrange and support pipe work so that it remains free from vibrations whilst permitting necessary movements such as thermal expansion and contraction.
- Keep the number of joints to a minimum.



### 3.12.211 Excavation

All fixtures shown on the design drawings are to be excavated for, installed and connected in a neat, waterproof manner in accordance with the manufacturer's specification and the standard drawings **as issued in the NT Plumbing code.**

Tree roots encountered in excess of 75mm are to be bored under. No root in excess of 75mm shall be cut without prior approval of the Officer. Roots smaller than 75mm shall be clean cut not less than 600mm from the pipeline. All obstructions such as stumps, boulders and the like which may in the opinion of the Officer / Consultant interfere with the pipe-work are to be removed.

Where required by relevant authorities, provide under road boring, by an approved specialist, in lieu of trenches.

All pipelines beneath roadways shall be heavy duty conduit, crossing at right angles to the road centreline.

The bore is to be tightly backfilled / grouted around the conduit. Any damage sustained as a result of excavation / boring work is to be made good by the Developer.

### 3.12.212 Access

All fixtures that are to be located to enable the removal of pipes or maintenance of fittings in accessible positions, with adequate clearance and in a position that does not interfere with any adjacent or associated services.

## 12.30 TRENCH DETAILS

Provide trench widths and depths in accordance with the following tables.

Trench Width

UPVC PIPE SIZE	TRENCH WIDTH
40 mm	190 mm
50 mm	200 mm
80 mm	230 mm
100 mm	250 mm

Minimum Cover (FROM FINISHED SOIL LEVEL TO TOP OF PIPE)

PIPE WORK	MINIMUM COVER
Mainline	400 mm
Sub-mains	300 mm
Lateral Paved	300 mm
Lateral Unpaved	300 mm
In Rock	As advised

### 3.12.213 Backfilling of Trenches

- Backfill to all trenches within the road shall comply with Standard Fill.
- Backfill outside the road shall comply with Appropriate Fill
- All backfill shall be free from builder's waste, bricks, rocks or similar material that would be retained on a 25 mm sieve.
- Backfill trenches as soon as possible after approval of laid and bedded service. Compact to the density that applies to the location of the trench. Minimum density to be 85% MMDD
- Compact so that the pipe is buttressed by the walls of the trench.
- When occurring, subsidence of backfill is responsibility of the Developer for the 12 month minimum maintenance period.



- Provide a minimum of 75 mm sand bedding to the top of pipe work. Sand is to be free from stone and other debris over total width of all excavations.
- Indigenous soil is preferred providing it contains no rock larger than 25 mm.
- Where irrigation trenches occur in topsoil areas, complete the back filling with 100mm minimum topsoil to the same depth as adjoining areas. Final grade should be consistent with surrounding levels.

#### 3.12.214 Thrust Blocks

Thrust blocks are to be constructed of concrete with one side bearing against a firm vertical face of the excavation and designed so that the full hydrostatic force in the pipe work is transmitted to surrounding soil without the maximum bearing pressure of soil and pipe work being exceeded.

Pipe work shall not be charged with water until such time as all thrust blocks have fully cured.

### 12.31 IRRIGATION SYSTEM

Fully automatic irrigation systems are to be supplied and installed in accordance with the specification and relevant drawings.

The works shall include but not necessarily be limited to the following:

- Fully automatic pop-up irrigation system to areas of irrigated grass as indicated on the drawings.
- Filtration and back-flow prevention.
- All irrigation system connections to potable water supplies are to be in accordance with AS 3500.1
- Where possible unless otherwise stated materials should be Australian made.

#### 3.12.215 Mainline Pipe Work

- All pipe work upstream of control valves to be minimum class 12 to AS 1477
- Fittings to be class 18.

The Officer reserves the right to change location of laterals to suit plants.

#### 3.12.216 Lateral Pipe Work

Requirements:

- Sprinkler operating pressure below 200 kPa – Low Density Polyethylene
- Sprinkler operating pressure above 200 kPa – UPVC minimum class 9
- Trickle laterals high density metric-sized accordingly.

### 12.32 MONITORING EQUIPMENT

The Officer (Parks Manager) is to be consulted as to the nature and specification of monitoring equipment required at individual sites. A typical site shall require a Rainswitch and Flow Transducer, however, additional equipment may be required.

#### 3.12.217 Controllers

All Controllers are to be in accordance with Shire of Wyndham East Kimberley's Telemetric Central Control systems specifications and in accordance with the approved drawings (i.e. Rainman – A/C, D/C control unit or Rainman – Solarman remote valve control unit to be controlled from an existing Rainman Controller).

All Control Boxes shall be fixed to powder coated pole or pedestal appropriate to the location. (Pole to be 75mm x 4.0m [3.4m above ground level] for Controller and/or radio antenna, Pedestal to be 75mm x 1.8m, powder coat colour – Heritage Green).

All Solar Control sites to have approved Rainman solar panel and mounting (details available from Rainman local distributor).



### 3.12.218 Automatic Control Valves and Control Wires

Automatic control valves shall be 24V solenoid actuated hydraulic valves with flow control and a maximum operating pressure rating of at least 1 MPa. Valves used shall be able to be serviced without removal from the line. Install; of the same diameter, a ball valve (Philmac/Turnflo) upstream from the solenoid and a barrel union or quick fix coupling downstream.

Valves used shall be Richdel (or equivalent) model valves with bleeding valves and flow control. A master valve shall be fitted to all systems.

All valves shall be housed in Hardie Jumbo Lockable valve boxes, or similar, immediately upstream from each automatic control valve. House both valves in a rectangular valve box with high impact plastic cover at the finish ground level. The floor of all boxes should be gravelled to an appropriate depth to prevent slit incursion whilst still allowing the contents to be inspected / serviced without need for excavation.

Connect the automatic valves to the controller with building wire laid in sealed conduits, within the mainline. Lay intertwined for their full length without joints except within valve boxes. Use waterproof connection. Provide expansion loops at each solenoid lead joint. Backfill trenches only after inspection and approval of wiring. Minimum size active 1.5 sq.mm laid in closed loop. Maximum allowable voltage drop over total wiring route length shall be 4 volts.

Where appropriate wiring installation should allow for spare capacity.

### 3.12.219 Sprinkler Risers, Drippers and Dripper Locations

All in-ground heads shall be mounted on PVC pipe based laterals on polypropylene articulated risers.

Drippers must have flush valves and be of the turbulent flow type, easily dismantled for cleaning.

The drippers are to connect directly to the pipework or by micro tubes.

When used for tree planting, a minimum of two drippers per tree are to be installed.

LOCATION	ITEM	REQUIREMENT
As on approved drawings	Sprinkler	Type Gear driven – Hunter
As on approved drawings	Automatic valve	Type Size Solenoid operated Maximum pressure loss 40Kpa
At each plant as specified	Drippers	Type Turbulent flow, P/c

### 3.12.220 Maintenance / Warranty

A minimum maintenance period of 12 months from the date of completion on all parts and workmanship applies except where repairs are due to theft, vandalism and existing equipment failure operator and/or misuse.

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## **APPENDICES**

- Appendix A Guidelines Amendment Request Form**
- Appendix B Design Approval Checklist**
- Appendix C Deed of Agreement (Example)**
- Appendix D On Maintenance Procedure Checklist**
- Appendix E On Maintenance Site Inspection Checklist**
- Appendix F Certificate of Acceptance (Example)**
- Appendix G Off Maintenance Procedure Checklist**
- Appendix H Off Maintenance Site Inspection Checklist**
- Appendix I Asset Register Forms**
- Appendix K CAD Drawing Requirements**

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# APPENDIX A – GUIDELINES AMENDMENT REQUEST FORM

Attention        The Development Officer  
                    Subdivision and Development Guidelines  
                    Planning and Design Section  
                    Shire of Wyndham East Kimberley  
                    PO Box 614  
                    Kununurra WA 6743

This form may be reproduced for the purposes of submission of a proposed amendment without breaching copyright.

## REQUESTOR'S DETAILS

**Name**            .....

**Firm**             .....

**Address**        .....

                         .....

---

## PROPOSED AMENDMENT DETAILS

Please use separate forms for each amendment requested.

**Part**

**Section**

**Details**        .....

                         .....

                         .....

                         .....

                         .....

Please attach further details if required

---

## REVIEW

**Comments**     .....

                         .....

                         .....

**Approved / Not Approved**        .....        **Date**.....

**Returned to Applicant**            .....        **Date** .....

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# APPENDIX B – DESIGN APPROVAL CHECKLIST

For Internal SWEK Use as well as Consultant / Developer Use

**PROJECT** ..... **SUBMISSION** 1, 2, 3, 4, 5

**CONSULTANT** ..... **DATE SUBMITTED** / /

- Initial Design Discussions with SWEK
- Design Roadworks to SWEK for Comment / Approval. The following items are to be submitted:

### DOCUMENTS

- Proof of Appointment to Act for the Developer
- Copy of relevant Agreements and supporting documentation if development is to be carried out on Crown Land
- Copy of current Development Permit(s)
- Copy of Permission to Carry out Works on Other's Land
- Executed Development Application Form (together with Application Fee – see below)
- Design Report(s)
- Drainage calculations and plans
- Pavement design calculations
- Geotechnical and Soil Types Report
- Approvals from Other Authorities
- Estimate of Cost for Construction of Works
- Specification and Standard Drawings for Civil Works
- Specification and Details for Stormwater Management and Erosion Control Works
- Necessary certifications
- Any other items required, ie, Structural drawings and computations, etc.
- Copy of appropriate Public Risk Insurance

### PLANS

All plans must be signed as **Checked** and **Approved** by the appropriately qualified person.

Two copies of all drawings are required, if plans are A3 size. If plans are larger, ie, A2+, then 3 copies minimum are required.

- Stormwater Management and Erosion Control Drawings
- Structural Drawings if required, ie, retaining walls, fences, footings, etc
- Civil Drawings made up as follows:
  - Services
  - Roadwork & Drainage & Subsoil Drainage Layout
  - Roadworks Longitudinal Sections
  - Roadworks Cross Sections
  - Drainage Longitudinal Sections
  - Intersection, Bends, and Court Details
  - Typical Sections, General Notes, Locality Plan
  - Any other relevant drawings

### PAYMENTS

- Design Approval Fee (0.5% Estimated Cost for Construction of Works)

**CHECKED** ..... **DATE CHECKED** / /

**COMMENTS** .....

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# APPENDIX C – DEED OF AGREEMENT EXAMPLE

## DEED OF AGREEMENT

This Deed of Agreement (“**The Deed**”) is made on the date shown below

**BETWEEN:** **THE DEVELOPER, XXX (XX) Pty Ltd** of xx Street, XX XX 0800 (“**The Developer**”)

**AND:** **THE SHIRE OF WYNDHAM EAST KIMBERLEY**, the SWEK for the Municipality of XXXX in XXX of Australia, and having its office at XXXX (“**The SWEK**”)

**WHEREAS:**

The Developer is carrying out roads works at XX that is to be developed for the purposes of XX.

This Deed contains the **SCHEDULE**, which describes SWEK’s requirements and procedures for the works for the roadworks of the subject land, as set out and referred to in the application.

**IT IS AGREED AS FOLLOWS:**

The Developer will construct and/or provide the works/items set out in the SCHEDULE at the Developer’s cost. All works are to be in accordance with designs and specifications and SWEK’s technical requirements and procedures as set out in SWEK’s current Guidelines for Rural Road Design and Construction, all to the satisfaction of the Director Technical Services, Shire of Wyndham East Kimberley.

**THE SCHEDULE**

1. Any easements or reserves required for the purposes of stormwater drainage, roads, or for any other purpose stipulated by SWEK, shall be made available to SWEK.
2. Engineering designs and specifications for the proposed and affected roads, stormwater drainage and driveways to the lot boundaries.

Executed as a Deed this \_\_\_\_\_ day of \_\_\_\_\_ 2001

The common Seal of **XX** as affixed in the presence of:

..... <b>DIRECTOR</b>	..... <b>DIRECTOR</b>
..... NAME OF DIRECTOR (print)	..... NAME OF DIRECTOR(print)

The Common Seal of the **SHIRE OF WYNDHAM EAST KIMBERLEY** was affixed in the presence of

..... <b>LORD MAYOR</b>	..... <b>TOWN CLERK</b>
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# APPENDIX D – ON MAINTENANCE PROCESS CHECKLIST

For Internal SWEK Use as well as Consultant / Developer Use

**PROJECT** .....

**CONSULTANT** .....

**APPLICATION DATE**     /   /

**INSPECTION DATE**     /   /

- Application for Works to be Placed on Maintenance
- On Maintenance Inspection
- Bond Application to SWEK and Outstanding Works
- Confirmation of Outstanding Works or other Security Bonds and Fee Details
- Submission of Certification of works     Roads and Drains  
   Landscape / Irrigation  
   Structural  
   Other Authorities  
   Other
- Submission of As Constructed Drawings     Hard Copy  
   Digital (conforming to Appendix K)
- Submission of Clearances     Private Owners  
   Other Authorities
- Submission of Test Results and Reports
- Submission of Cadastral Survey Plan with Final Easement Details (if required)
- Submission of     Maintenance Bond  
   Construction Approval Fee  
   Outstanding Works or other Security Bonds  
   Footpath, Crossover and Driveway Payment
- Asset Register Forms
- Issue of On Maintenance Certificate

**CHECKED** .....

**DATE CERTIFICATE ISSUED**     /   /

**COMMENTS** .....

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## APPENDIX E – ON MAINTENANCE SITE INSPECTION CHECKLIST RURAL ROADWORKS

All test results, inspections, certifications, as constructed drawings and clearances in place. The Works have been visually inspected and the following constructed to approved drawings and satisfactory standards:

### DRAINAGE

- Catch drains – location, profile, line, level, outlet with erosion control;
- Field inlets;
- Overland flow path including Q100 open drains – profile, line, level, grassing established, erosion control, concrete lining;
- Pipework, headwalls, outlets, floodways;
- Soil and stormwater management in place.
- Open cut channels – profile, line, level, grassing, erosion control measures;
- Sub soil drainage connections to pits, flush points, discharges to gullies or other approved outlet;

### EARTHWORKS

- Retaining walls located clear of road reserves;
- Batter slopes stabilised, free from erosion;
- All disturbed areas grassed, free from erosion;
- Soil and stormwater management in place;
- Compaction test results, inspection records, certifications.

### ROAD SURFACING

- Hot mix wearing course sound in appearance and showing no signs of cracking, blemishes, erosion and oxidation;
- Bitumen seal sound in appearance, no blemishes, adequate aggregate cover, no bitumen bleeding through surface, excess aggregate removed from site.
- Joints are flush;
- Kerbs and pavements free of overspray, splashes and marks;
- Final profile is regular, crowns correctly located, no obvious high points, hollows, low points and ponding of water;
- Joints with concrete works are sound and to the correct level. No gaps for water intrusion.

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## APPENDIX E - ON MAINTENANCE SITE INSPECTION CHECKLIST (Continued)

### OTHER SERVICES

- All approvals as constructed received and submitted;
- All pit and manhole covers constructed to correct levels and slopes;
- All services, road crossings permanently marked as required on kerbs or by approved markers;

### OTHER

- Street names signs with house numbers;
- Traffic signs and markers and pavement marking.

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# APPENDIX F – CERTIFICATE OF ACCEPTANCE (Example)

## CERTIFICATE OF ACCEPTANCE AND ON MAINTENANCE OF WORKS

**DEVELOPER:** ABC Industries Pty Ltd  
**LOCATION OF WORKS:** 6623, 6624, 6666 to 6671 and 6692

### INSTRUMENT OF

#### DETERMINATION NO:

**CONDITIONS:** 2, 6, 7 & 10

**WORKS:** Roads construction from X to Y or Z.

Shire of Wyndham East Kimberley confirms that the above works as prescribed by the plans and specifications previously submitted have been satisfactorily constructed and are hereby accepted for maintenance purposes subject to a Maintenance Period (Defects Liability Period) as follows.

#### 1. Roads, Stormwater Drainage, Kerb Crossovers, Driveways and Footpaths

Commences 3 May 2000 Finishes 3 May 2001

**Notes** The Developer is required to contact the Shire of Wyndham East Kimberley thirty (30) days prior to the expiry of the Defects Liability Period and arrange an inspection of the site. The Developer acknowledges that final Handover of Works to SWEK for ongoing care and maintenance and the release of the Security (Maintenance Bond), will not occur until such notification has been given and such an inspection has taken place and all outstanding defects are remedied.

The Shire of Wyndham East Kimberley has the right to retain any such portion of the Security as it deems necessary to cover the defects corrected during the Defects Liability Period. This shall be returned to the Developer progressively upon the expiry of the relevant individual Defect Liability Periods of each defect.

**Defects** The following listed items are exceptions to the above and must be completed by the date agreed below. The Developer agrees to rectify the defects in accordance with SWEK 's minimum requirements. The Defects Liability Period for these particular items shall commence on the date they are completed.

ITEM	DATE OF COMPLETION
1. Erosion Control Works	31 May 2000

.....  
DIRECTOR TECHNICAL SERVICES

.....  
DEVELOPER'S REPRESENTATIVE

Date.....

Date.....

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# APPENDIX G – OFF MAINTENANCE PROCEDURE CHECKLIST

For Internal SWEK Use as well as Consultant / Developer Use

**PROJECT** .....

**DATE REQUEST SUBMITTED**    /    /

**CONSULTANT** .....

- Request from Developer for Off Maintenance Inspection and Return of Security(s)
- Off Maintenance Inspection
- Issue of Off Maintenance Certificate by SWEK - Works Taken Over by SWEK

**INSPECTION DATE**            /    /

**DATE MAINTENANCE CERTIFICATE ISSUED**            /    /

**COMMENTS** .....

.....

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## APPENDIX H – OFF MAINTENANCE SITE INSPECTION CHECKLIST

**All further test results, inspections, certifications, as constructed drawings and clearances in place. The works have been visually inspected and are satisfactory allowing for normal wear and tear. The requirements are as follows but not limited to:**

- All clearances from Other Authorities and Others received;
- All pit, valve, manhole, service boxes to correct levels and slopes, no obstructions in verges, grassed areas, etc;
- Line marking re-marked where necessary.
- Street name and other signs still in place

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**APPENDIX I –ASSET REGISTER FORMS**

**Copy of SWEK’s current Asset Register Forms are to be attached.**

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## APPENDIX J – CAD DRAWING REQUIREMENTS

**Copy of Design Section current External CAD requirements are to be attached.**

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