|  |  |  |  |
| --- | --- | --- | --- |
| Northern Territory Government |  |  | DEPARTMENT OF INFRASTRUCTURE, PLANNING AND LOGISTICS |

|  |
| --- |
| REQUEST FOR TENDER |

|  |  |
| --- | --- |
| **Infrastructure, Investment and Contracts** |  |

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|  |  |
| **TENDER:** | **DARWIN REGION - RAPID CREEK - FLOOD MITIGATION - CONSTRUCTION** |
| **NUMBER:** | **T16-1163** |
| **CLOSING:** | **2:00 PM Australian CENTRAL STANDARD TIME**  **WEDNESDAy, 19th April 2017**  **(Late Tenders Will Not Be Accepted)** |

|  |  |
| --- | --- |
| LODGEMENT OF TENDERS: | |
|  | |
| By Electronic Lodgement facility at:  [**www.nt.gov.au/tenders**](http://www.nt.gov.au/tenders) | |
|  | |
| ***By Facsimile:*** | ***By Post:*** |
| (08) 8999 1935 | Department of Corporate and Information Services GPO Box 1551 Darwin NT 0801 |
|  |  |
| Note: no other form of delivery is acceptable. | |

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| --- | --- |
| **RFT NUMBER:** | T16-1163 |
| **RFT TITLE:** | DARWIN REGION - RAPID CREEK - FLOOD MITIGATION - CONSTRUCTION |

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Response Schedules are provided separately from this Request for Tender document

DRAWINGS SEPARATE FROM THE RFT

This is the specification marked "A" referred to in the Annexed Agreement with the Principal.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Dated this |  | day of |  | 2017 |
|  |  | | | |
| Signature |  | | | |
|  |  | | | |
| Witness |  | | | |

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# Conditions of Tendering

## general

Unless the contrary intention is indicated, these Conditions of Tendering are to be interpreted in the same manner and words have the same meaning as in the Contract.

If a date stipulated for doing an act in relation to the RFT is not a business day (being any day which is not a Saturday, Sunday or a public holiday in the Northern Territory, as specified in Schedule 2 of the Public Holidays Act (NT)), the act must be done on the next business day.

In these Conditions of Tendering the following definitions apply:

**'Addendum'** means any document expressly stated to be an Addendum, which is issued by the Principal varying some provision in the original RFT prior to the stated closing time and date.

**‘Annexure’** means the document titled “Annexure to the Conditions of Contract” and contained in this RFT.

**‘Contract’** means the document titled ‘Conditions of Contract’ and contained in this RFT.

**‘Local Benefit Advisory Panel’** means a panel of Territorians established by the Minister responsible for Procurement to provide advice on Local Content and Local Benefit Commitments.

**'RFT'** means this request for tender inviting offers and includes all conditions, annexures, schedules, attachments and addenda.

**'Tender Response'** means all documents lodged by the Tenderer in response to the RFT.

**'Tenderer'** means the person lodging a Tender Response.

**‘Works’** means the works required by the Principal and described in this RFT.

## Preparing a Tender Response

### General Requirements

Each Tender Response is required to contain one copy of the documents listed in the clause titled “Documents to be Lodged” in these Conditions of Tendering.

Tender Responses should contain:

1. if the Tenderer is an individual, their full name;
2. if the Tenderer is company or organisation, its company, business or trading name and unique business identifier required by law (eg ACN/ARBN/ABN);
3. the address for service of any notices necessary or required to be or which may be served on or given to the Tenderer in connection with its Tender Response and any subsequent contract arising out of acceptance of the Tender Response.

Each Tender Response (excluding attachments or supplementary information provided by the Tenderer) must be in English. A Tender Response that does not comply with this requirement will be declared inadmissible for assessment.

### Tenderers to Inform Themselves

Tenderers must, at their own expense, inform themselves of all circumstances and conditions relating to submitting a Tender Response and carrying out the Works. This includes compliance with all legislation, an inspection of the relevant site(s) and satisfying themselves as to the correctness and sufficiency of the RFT documentation.

### Tender Costs

The Tenderer is responsible for all costs associated with preparing a Tender Response.

The Principal will not be liable for any expense or loss, which may be incurred by any Tenderer in the preparation or submission of its Tender Response.

### Compliance with NT Procurement Code

In preparing its Tender Response, submitting its Tender Response and throughout the tendering period the Tenderer must comply with the Northern Territory Procurement Code (**‘Code’**).

A copy of the Code is available at:

http://www.dob.nt.gov.au/business/tenders-contracts/legislative\_framework/Pages/code.aspx

If the Principal is of the reasonable opinion that the Tenderer has not complied with the Code, the Principal will declare the Tender Response inadmissible for assessment.

### Enquiries

Should the Tenderer:

1. have any doubts as to the meaning of any part of the RFT; or
2. find any discrepancy, error or omission in the RFT,

the Tenderer should seek clarification from the person listed below, as early as possible but in any event before the stated time and date for closing of the RFT.

|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| For enquiries about the Works contact | | Name | Jack Noble |
|  |  | Telephone | (08) 8999 4732 |
|  | | Facsimile | (08) 8923 7661 |
|  | | Email | [jack.noble@nt.gov.au](mailto:jack.noble@nt.gov.au) |
|  | | | |

The Principal may decline to provide a clarification or further information requested by a Tenderer.

Any clarification provided by the Principal may be provided to all prospective Tenderers.

### Probity Advisor

The Principal may appoint an independent probity advisor to advise on probity issues arising during the course of the RFT process. The details of the probity advisor, if any, are contained below. Any issues about the integrity of the RFT process should be addressed to the probity advisor.

|  |  |  |  |
| --- | --- | --- | --- |
| Probity Advisor | | Name | Not Applicable |
|  |  | Telephone | Not Applicable |
|  |  | Email | Not Applicable |

### Addendum

The Principal may vary, update or clarify the RFT at any time before the stated time and date for closing of the RFT through the issue of an Addendum.

No explanation or amendment to the RFT will be binding unless in the form of an Addendum. Any Addendum issued under this clause will become part of this RFT.

It is the sole responsibility of Tenderers to ensure that the contact details held by Quotations and Tenders Online Service are correct and up-to-date in order for them to receive Addendum.

### Best Offer

Notwithstanding anything which may be done pursuant to the assessment process, the Principal intends to select the successful Tenderer primarily on the basis of the Tender Responses lodged but will also take into consideration any other information publicly available or known to the Principal. Accordingly, Tenderers should provide their best offer in their Tender Response.

## Tender Response Validity

Tender Responses must remain valid and open for acceptance by the Principal for a period of 60 days.

If a Tender Response is not formal in accordance with these Conditions of Tendering, the validity period will commence from the date on which the Tender Response is formalised to the satisfaction of the Principal.

Upon the expiry of the validity period:

1. a Tenderer may withdraw their Tender Response by written notice to the Principal; or
2. the Principal may request an extension to the validity period.

## Site Inspection

Prior to submitting a Tender Response the Tenderer is encouraged to inspect the site(s) relevant to the Works. If the Tenderer elects to inspect the site(s), permission must be first obtained by contacting the following during business hours:

|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| Permission to visit Site contact: | | Name | Jack Noble |
|  |  | Agency | Department of Infrastructure, Planning and Logistics |
|  |  | Telephone | (08) 8999 4732 |

## Industry Briefing

An industry briefing is not applicable to this RFT.

## Industry Accreditation

The Tenderer and each subcontractor engaged in the provision of the Works, equal to or greater than $100,000 is required, at the time and date for closing of the RFT, to be accredited or recognised by Contractor Accreditation Limited (**‘CAL’**).

Accreditation must be to a rating that is equal to or higher than the total value of the Tender Response or subcontractor’s work in the CAL category, group or sub-group described below.

|  |
| --- |
| Industry Accreditation Requirements |
| CIVIL WORKS / Earthworks and Pavements |

The Tender Response should include the Tenderer’s and relevant subcontractors’ CAL registration number.

If, at the time and date for closing of the RFT, the Tenderer or its subcontractors require an upgrade of the rating of their existing CAL accreditation, in the applicable category, group or sub-group, the Tenderer has fourteen (14) calendar days from the stated time and date for closing of the RFT to:

1. obtain an upgrade of the rating of that existing CAL accreditation; and
2. provide written evidence of the upgrade to the Principal’s contact person identified in the Annexure.

Nothing in this clause allows a Tenderer to obtain CAL accreditation in a new CAL category, group or sub-group after the stated time and date for closing of the RFT.

Any Tender Response not complying with the requirements of this clause may be declared inadmissible for assessment.

More information on CAL, accreditation details and application forms can be obtained from:

CAL Registrar  
PO Box 125  
Parap NT 0804  
Telephone: (08) 8922 4600  
Facsimile: (08) 8984 4003

Website: www.accreditation.com.au

## Alternative Tenders

Tenders are required to be submitted strictly in accordance with the RFT document and no alternatives will be considered.

## Part Offer and Part Acceptance

Tenders are required to be submitted for the whole of the Works.

## Pricing

### General Requirements

Unless otherwise specified, prices must:

1. be stated in Australian dollars;
2. be inclusive of:
3. GST (where applicable);
4. all costs required to carrying out the Works, including labour, materials, transport, freight, overheads, profits and charges; and
5. all taxes, fees, duties, royalties, premiums, costs, charges and the like which will be due and payable to any person or authority under the Contract.

Unless otherwise required, pricing must be submitted for each item in the Schedule and failure to price all items may result in the Tender Response being declared inadmissible for assessment.

### Estimated Quantities

Unless otherwise specified, any quantities given in the RFT are not guarantees as to the amount of work to be provided to the successful Tenderer, but will be used for assessment purposes only.

### Treatment of Low or Aberrant Prices

Where a price (or a key element of a Tender Response price) is considered well below or above the median price or the Principal’s estimated value, the Tenderer may be requested to confirm the tendered price or respond to questions regarding particular aspects of the Tender Response. The Tenderer may also be requested to provide written confirmation that the requirement and contractual obligations relevant to the Works are fully understood.

The Principal may, at its discretion, either:

1. proceed with the evaluation of the Tender Response; or
2. where there is evidence that acceptance of the Tender Response may result in an unacceptable contract outcome or pose a substantial risk to the completion of the Works or the sustainability of the Tenderer, declare the Tender Response inadmissible for further assessment.

### Competitive Neutrality

Government owned businesses, Local, Territory, State and Federal Government agencies and authorities responding to this RFT must submit two prices against each item in the pricing schedule. One price is to be the tendered price offered and the other being the adjusted competitively neutral price. The competitively neutral price is to be prepared in accordance with the Northern Territory Government’s Competitive Tendering Guidelines.

A copy of the Guidelines is available from:

<https://nt.gov.au/industry/government/procurement-conditions-framework/competitive-tendering-guidelines>

## Impartiality of Requirements

Unless otherwise specified if an item is specified as being similar or equivalent to a particular brand in the Scope of Works this is to set an acceptable standard only and no preference is given to that brand.

Any items offered must be at least of the same standard and potential as specified in the Scope of Works, or as is inherent in the equivalent brand. The Principal may accept items of higher standard than specified if the items offer better value-for-money outcomes. Where such is being offered full details by way of illustrations, catalogues, brochures and the like, should be provided with the Tender Response.

## Conflict of Interest

For the purpose of this clause a “Conflict” means any matter, circumstance, interest, or activity affecting the Tenderer (including the officers, employees, agents and subcontractors of the Tenderer) which may or may appear to impair the ability of the Tenderer to perform the Contract diligently and independently.

Tenderers must declare any Conflict in their Tender Response.

Tenderers must not place themselves in a position that may, or does, give rise to a Conflict during the RFT process.

If at any time during the RFT process, a Tenderer is aware that an actual, potential or perceived Conflict exists or may arise, that Tenderer must immediately notify the Principal.

If a Conflict exists or arises during the RFT, the Principal may:

1. declare the Tender Response inadmissible for assessment;
2. enter into discussions to seek to resolve the Conflict; or
3. take any other action it considers appropriate.

## Project Control

The Works required under the Contract are to be carried out using ISO 9000 Quality Assurance.

The Tenderer's attention is drawn to the section titled "Quality Assurance" in the RFT.

The Tenderer is required to submit a Project Quality Plan Proposal with the Tender Response.

Any Tender Response in which the Project Quality Plan Proposal is not provided may result in the Tender Response being declared inadmissible for further assessment.

## Occupational Health and Safety Accreditation Scheme

The Tenderer is not required to carry out the Works using the Occupational Health and Safety Accreditation Scheme (Cth).

## Building Code 2013 and Supporting Guidelines

The Tenderer is not required to carry out the Works using the Building Code 2013 and the Supporting Guidelines to the Building Code 2013.

## Local CONTENT

The NT Government is committed to supporting businesses that use local contractors and suppliers and hire and train Territorians. Assessment will take into consideration businesses that demonstrate a commitment to supporting and employing Territorians including Indigenous Territorians, accredited training for its employees and sourcing goods and services from local businesses.

### Apprentices and Trainees

The Tenderer will, if awarded the Contract, employ and train a minimum number, as prescribed below, of apprentices/trainees who are registered in the Northern Territory:

**Schedule of Minimum Number of Apprentices/Trainees.**

| **Value Of Contract ($000)** | **Trade Apprentice/Trainee** | **Non-Trade Trainee** |
| --- | --- | --- |
| 300 – 599 | 1 | - |
| 600 – 999 | 2 | - |
| 1000 – 1999 | 3 | 1 |
| 2000 – 2999 | 4 | 1 |
| 3000 – Plus | 5 | 1 |
| Maximum Requirement | 5 | 1 |

Employees undertaking apprenticeships/traineeships training will only be recognised for assessment purposes if:

1. a signed training contract for the apprentice/trainee is registered with the Australian Apprenticeships NT Office; or
2. the apprentice’s/trainee’s details appear on the Data Entry Level Training Agreement (DELTA) database, maintained by the Department of Business; or
3. the training being undertaken is a recognised accredited training course.

In complying with the use of accredited apprentices/trainees, the Tenderer may:

1. directly employing apprentices/trainees;
2. utilise group training scheme apprentices/trainees;
3. utilise sub-contractors apprentices/trainees; or
4. utilise any combination of the above.

For contract values of $1 million and above one (1) non-trade trainee may be substituted for a trade apprentice/trainee for the purpose of determining compliance with the Schedule of Minimum Number of Apprentices/Trainees.

The level of compliance with this requirement will be reported on at the end of the Contract and taken into consideration on future quotations or tenders for a period of twelve (12) months.

Further information on NT Government Policy on the use of apprentices/trainees on Government Contracts and accredited training programs can be obtained from:

Training Operations Unit  
Department of Business  
11th Floor, Mitchell Centre,  
55 – 59 Mitchell Street  
Darwin NT 0800  
Telephone: (08) 8935 7707  
Facsimile: (08) 8901 1326  
email: govtcontracts@nt.gov.au

Or

GPO Box 3200  
Darwin NT 0801

Further information regarding the employment of apprentices/trainees can be obtained from:

Australian Apprenticeships NT  
6 Searcy Street  
Darwin NT 0800  
Telephone: 1300 137 130 or Telephone: (08) 8935 8200  
email: [Darwin@aacnt.com.au](mailto:Darwin@aacnt.com.au)

Or

GPO Box 3049  
Darwin NT 0801

Or

19 Hartley Street  
Alice Springs NT 0870  
Telephone: (08) 8953 3311

### Indigenous requirements for Regional Councils

Not Applicable

### Indigenous Development Plan

The Works have been identified as an opportunity to develop employment outcomes for Indigenous Territorians. The Tenderer is required to submit, as part of its Tender Response, an Indigenous Development Plan Proposal.

Any Tender Response not complying with the requirements of this clause may be declared inadmissible for further assessment.

## Industry Participation Plan

In accordance with the NT Government’s framework of Building Northern Territory Industry Participation, Tenderers are required to demonstrate their commitment to local participation, in relation to the Works to be completed, in their Tender Response. The successful Tenderer will be required to agree to an Industry Participation Plan to accompany the Contract.

Failure to demonstrate a commitment to local participation in the Tender Response or the subsequent development of an Industry Participation Plan may result in the Tender Response being declared inadmissible.

An information guide about Industry Participation Plans is included with the RFT.

Further information and assistance in relation to Industry Participation Plans is available from:

Department of Business  
Development House, 76 The Esplanade  
Darwin NT 0800

GPO Box 3200  
Darwin NT 0801

Telephone: (08) 8999 5201  
Facsimile: (08) 8999 5106  
Email: [industryparticipation@nt.gov.au](mailto:industryparticipation@nt.gov.au)

## Signing Documents

The Tenderer is required to sign its Tender Response as indicated below:

1. If the Tenderer is a company:
   1. with its common seal, and the fixing of the seal witnessed by:
      * two (2) directors of the company; or
      * a director and a company secretary of the company; or
      * for a proprietary company that has a sole director who is also the sole company secretary – that director; or
   2. without its common seal, if signed by:
      * two (2) directors of the company; or
      * a director and a company secretary of the company; or
      * for a proprietary company that has a sole director who is also the sole company secretary – that director; or
   3. by being signed by a person or persons authorised by the company to bind it in contract. In such circumstances a copy of the authorisation must be submitted with the Tender Response.
2. In the case of a firm (including a firm trading under a business or trading name and a partnership):
3. by signature of each proprietor of the firm; or
4. in the case of firms having more than five (5) proprietors, by signature of the proprietors authorised to bind the firm in Contract. In the case of the later evidence of the authority of those proprietors to bind the firm may be required by the Principal.

Where the Tenderer is lodging its Tender Response via the Quotations and Tenders Online eLodgement Service, there is no requirement to complete the "signature" block on the Declaration by Tenderer form.

## Lodgement of Tender Response

### Lodgement

Unless otherwise directed by the Principal, Tender Responses must be lodged using one of the following methods:

1. prepaid post, directed to the postal address stated on the cover to the RFT;
2. facsimile, directed to the facsimile number stated on the cover to the RFT; or
3. electronically, against the corresponding Tender number using Quotations and Tenders Online eLodgement through the address stated on the cover to the RFT or if the Principal has approached a specific Tenderer(s) and provided access to the RFT through a link or web address, electronically using the link or address provided.

Failure to comply with the above requirements will result in the Tender Response being declared inadmissible for assessment.

If, for any reason, a part of a Tender Response (excluding the pricing schedule(s)) becomes corrupt, illegible, inadequate or incomplete as a result of transmission or storage, the Principal may request an additional copy of the Tender Response.

If, for any reason, the pricing schedule(s) contained in a Tender Response becomes corrupt, illegible, inadequate or incomplete as a result of transmission or storage the Tender Response may be declared inadmissible for assessment.

|  |  |  |  |
| --- | --- | --- | --- |
| For enquiries about lodgement contact | | Name | Tenders Manager |
|  |  | Telephone | (08) 8999 1934 |
|  | | Email | [CAPSAssist@nt.gov.au](mailto:CAPSAssist@nt.gov.au) |
|  | | | |

### Documents to be Lodged

The Tenderer will complete in full, and submit one copy of the documents listed below.

Failure to provide all documents may result in the Tender Response being declared inadmissible for assessment.

|  |
| --- |
| TITLE |
| TENDERER DETAILS  DECLARATION BY TENDERER  SCHEDULE OF RATES SCHEDULE OF ASSUMPTIONS AND QUALIFICATIONS  RESPONSES TO ASSESSMENT CRITERIA  INDIGENOUS DEVELOPMENT PLAN PROPOSAL PROJECT QUALITY PLAN PROPOSAL  ENVIRONMENTAL MANAGEMENT PLAN PROPOSAL  WORK HEALTH AND SAFETY (WHS) MANAGEMENT  T16-1163 – SCHEDULE OF RATES (Must be submitted electronically in MS Excel Format) |

### Inadmissibility

Unless otherwise specified, Tender Responses provided to the Principal using a method that is not specified in clause 1.18.1, including but not limited to orally or electronically, will be declared inadmissible for assessment.

Tender Responses provided to the Principal by hand (including by a commercial courier service) may be declared inadmissible for assessment.

### Closing Time and Date

The RFT will close at the time and on the date stated on the front cover of the RFT.

### Late Tenders

Tender Responses are to be received, in full, by the time and date for closing of the RFT.

Failure to lodge a Tender Response, or part thereof, before the time and date for closing of the RFT may result in the Tender Response being declared inadmissible for assessment.

## Admissibility

Unless otherwise specified, if a Tenderer fails to comply with a requirement as set out in these Conditions of Tendering, their Tender Response may be declared inadmissible for assessment.

In determining whether a Tender Response is admissible for assessment the Principal will consider:

1. whether admitting the Tender Response will compromise the integrity of the tender process;
2. whether the Tenderer has or is likely to gain an unfair advantage;
3. reasons for the Tenderer’s failure to comply with a requirement;
4. whether the Tender Response is capable of assessment;
5. whether the Tender Response was mishandled by the Principal or a third party; and
6. evidence of unfair practices.

## Ownership of Documents

This RFT is, and will remain, the property of the Principal. It may only be used for the purpose of preparing a Tender Response.

All Tender Responses become the property of the Principal upon submission and will not be returned to Tenderers.

By lodging a Tender Response, a Tenderer licenses the Principal to reproduce the whole or any portion of the Tender Response for the purposes of the conduct of the RFT, including assessment, clarifications, resultant contract negotiation, contract management, and anything else in relation to these purposes.

Nothing in this clause changes or affects the ownership of copyright or other intellectual property rights that may subsist in the Tender Response.

## Changes to the Conditions

### Conditions of Tendering

Tenderers are not permitted to request changes or propose alternatives to these Conditions of Tendering. Any Tenderer who proposes a change will be requested to withdraw the change in order to comply with the Conditions of Tendering. If the changes are not withdrawn the Tender Response will be declared inadmissible for assessment.

### Conditions of Contract

Tenderers are not permitted to request changes, or propose alternatives to the Conditions of Contract applicable to the RFT. If a Tenderer does so, the Tender Response may be declared inadmissible for further assessment.

## TENDER RESPONSE SHORTLISTING PROCESS

Tender Responses will be assessed in accordance this clause 1.22.

**1.22.1 General**

All admissible Tender Responses will be subject to the shortlisting process set out at clause 1.22.2.

**1.22.2 Shortlisting**

1. Responses will be shortlisted based on:
2. completeness of response;
3. local content;
4. past performance;
5. whether the Tender Response presents an acceptable level of risk to the Principal; and
6. price.
7. The Principal reserves the right, in its absolute discretion, to shortlist any number of Tender Responses, including one or more, all or none of the Tender Responses.
8. The Principal is not obliged to shortlist the lowest priced Tender Responses.
9. The Principal reserves the right, in its absolute discretion, to shortlist Tender Responses by taking into account any other factors it deems necessary and appropriate.
10. The Principal reserves the right at its absolute discretion, to remove a Tender Response from the shortlist at any time for any reason and will notify the Tenderer of its removal from the shortlist without any obligation to provide reasons for the removal.

**1.22.3 Shortlisted Tender Responses**

1. If a Tender Response is shortlisted, the Tenderer will be notified in writing by the Principal of that fact.
2. Shortlisted responses will then proceed to the detailed assessment as provided for in clause 1.22A.

**1.22.4 Non-shortlisted Tender Responses**

1. Where a Tender Response is not shortlisted, the Tenderer will be notified in writing by the Principal of that fact.
2. Non-shortlisted Tender Responses will be held in reserve to be considered in the event that the Principal elects not to proceed with any Shortlisted Tender Responses.
3. A Tenderer that has received notification under clause 1.22.4(a) shall be entitled to withdraw their Tender Response by giving the Principal written notice of such withdrawal within 5 Business Days of receiving the notice under clause 1.22.4(a).”

## 1.22A Tender Assessment Criteria

Selection of the successful Tenderer will be based on a best value for Territory assessment of Tender Responses against the tender assessment criteria specified in the Annexure.

An example of the types of considerations that may form part of each criterion are set out below, these elements are not to be considered exclusive to any specific RFT.

1. Past Performance:
   1. Performance history including experience in providing similar Supplies and the extent to which previous undertakings were achieved.
   2. Standard and quality of Supplies previously provided.
   3. Extent of supervision previously required.
   4. Disputes and claims history.
   5. References (including CAL if applicable).
   6. Safe and fair workplace record.
2. Timeliness:
   1. Ability to manage the provision of the Supplies within timeframes specified.
   2. Vulnerabilities to the completion timeframe.
3. Capacity:
   1. Ability to provide the Supplies including the experience and capacity of nominated personnel or subcontractors.
   2. Number, details and value of contracts currently in progress.
   3. Appropriate CAL accreditation (if applicable).
   4. Legal action pending.
   5. Financial capacity (including current credit rating).
   6. Risk.
4. Local Content:
   1. Enhancement of industry and business capability in the Northern Territory.
   2. Improved capacity and quality in supply or service response.
   3. Accredited training programs currently supported by the Tenderer or that will be supported or utilised in providing the Supplies.
   4. Proposed level of usage of apprentices and trainees in providing these Supplies.
   5. Proposed number of jobs for Territorians that will be supported or utilised in providing the Supplies.
   6. Proposed level of involvement of local Indigenous enterprise on these Supplies.
   7. Proposed level of usage of Territory Enterprises as sub-contractors or suppliers.
   8. Regional development opportunities.
   9. Any Northern Territory research and development proposals being undertaken or proposed by the Tenderer.
5. Innovation:
   1. New technology.
   2. Alternative solutions.
6. Scope Specific Criteria:
   1. Those criteria that are considered relevant to the nature of the Supplies being sought. Scope Specific Criteria could include, but are not limited to, environmental issues or requirements, technical requirements and specific experience and expertise applicable to the Supplies required.
7. Price:
   1. Upfront costs.
   2. Through-life costs, for example:
      1. Cost of ongoing training of Agency staff in providing the Supplies over a specific time; and
      2. Cost of transit in and out or implementation from one provider to another.
   3. Any other factors that would impact on costs to the Principal.
   4. Where a shortlisting process is utilised, Price will not be the only determining factor.

### 1.22A.1 Disclosure of Weightings

Assessment criteria and percentage weightings applicable to the RFT are as follows:

|  |  |
| --- | --- |
| Past Performance | 10% |
| Timeliness | 20% |
| Capacity | 10% |
| Local Content | 30% |
| Innovation | 0% |
| Scope Specific Criteria | 0% |
| Price | 30% |
| **TOTAL** | **100%** |
|  | |

## Conduct of the Assessment

### General

For the purpose of the assessment, clarification, negotiation and reporting of this RFT the Principal may disclose information acquired or developed during the assessment process (including a copy of the Tender Response) to Ministers and other Government representatives, consultants, advisors, other Agencies and statutory authorities in order to comply with obligations, exercise rights under this RFT and enable effective management or auditing of the Principal’s activities.

Without limiting the above this includes the release of information (including local content information contained in Tender Responses) to members of the Local Benefit Advisory Panel.

### Clarification and Additional Information

The Tenderer may be called upon to clarify information contained in their Tender Response or to supply information in addition to the Tender Response to demonstrate to the satisfaction of the Principal that the Tenderer has the ability to carry out the Works.

The Tenderer must within the time specified comply with any such requests. Failure to submit any or all of the information required, in the time stipulated, may result in the Tender Response being declared inadmissible for further assessment.

### Security, probity and financial checks

The Principal reserves the right during any part of the assessment of Tender Responses to perform such security, probity and financial investigations and checks as the Principal may determine are necessary in relation to Tenderers, their employees, officers, partners, associates, subcontractors or related entities and their employees, officers and subcontractors. These checks may include (without limitation) ascertaining in relation to each Tenderer:

1. security;
2. financial viability and stability;
3. managerial and technical capacity;
4. corporate history;
5. significant litigation (past, present or pending); and
6. any other matters the Principal considers relevant.

Tenderers must, at their cost, promptly provide the Principal with such information or documentation that the Principal requires in order to undertake such investigations or checks.

The Principal may declare a Tender Response inadmissible for further assessment if the Tenderer does not promptly provide all reasonable assistance to the Principal in this regard or based on the outcomes of the investigations or checks.

## Negotiations

1. The Principal may engage in detailed discussions and negotiations with one or more of those Tenderers who has had their Tender Response shortlisted under clause 1.22.
2. The Principal reserves the right to engage in detailed discussions and negotiations with one or more Tenderers who did not have their Tender Response shortlisted under clause 1.22.
3. Entering into detailed discussions and negotiations under this clause does not and will not bind the Principal to a contractual relationship and is not an indication that the Tenderer will be successful.
4. The result of any negotiations under this clause may be incorporated into the Contract.”

## Notification of Acceptance

The Principal will not be bound to accept the lowest or any Tender Response.

The successful Tenderer will be notified in writing on the completion of the RFT process **(‘Notice of Acceptance’**).

Unless otherwise specified, the Notice of Acceptance forms a binding agreement between the Principal and the successful Tenderer. On acceptance of its Tender Response the Tenderer will comply with clause 6.2 of the Contract. The Notice of Acceptance will, at the Principal’s discretion, be issued by pre-paid post, facsimile or email to the address stated in the Tender Response.

A Tenderer should not act on any representations or statements made by the Principal, its employees or agents prior to the issue of the Notice of Acceptance.

The Principal may publish details of the successful Tender Response, including the name of the Tenderer, value of the contract awarded and a description of the Works.

## Unsuccessful Tender Responses

1. All unsuccessful Tenderers will be informed in writing of the outcome of their Tender Response at the conclusion of the RFT process.
2. Any Tenderer who withdraws their Tender Response will not be informed under clause 1.26(a).
3. Tenderers may request a debriefing as to why their Tender Response was unsuccessful. This is for the purpose of assisting Tenderers to improve their competitiveness for future tenders. Any information discussed will be confined to the Tenderer’s Tender Response and under no circumstances will information relating to another Tender Response be disclosed.
4. Where a Tenderer’s Tender Response was not shortlisted under clause 1.22, that Tenderer will be entitled to request a debriefing as to why their Tender Response was not shortlisted. The information discussed will be limited to the aspects of the Tender Response that were considered in the shortlisting process under 1.22.

# Conditions of CONTRACT

The Conditions of Contract applicable to this RFT are the **Northern Territory Government Conditions of Contract – National Public Works Council NT Edition (NPWC) V5.0.00 (January 2015)**

Tenderers please note:

Section 2 comprising the Conditions of Contract are provided separately with the RFT document.

Electronic copies are also available at:

[www.dob.nt.gov.au/business/tenders-contracts/legislative\_framework/tendering-contract/Pages/default.aspx](http://www.dob.nt.gov.au/business/tenders-contracts/legislative_framework/tendering-contract/Pages/default.aspx)

Alternatively hard copies (paper) are available from the point of issue of the RFT.

You are advised to ensure you are familiar with the rules of tendering and with the contractual obligations of the parties under any subsequent Contract. You are further advised to reference the Annexure to Conditions of Tendering and Contract, which appear on the following pages that detail specific requirements applicable to this RFT.

# special conditions of contract

The following Special Conditions are in addition to the Conditions of Tendering and Conditions of Contract applicable to this Request for Tender.

Words and phrases used in these Special Conditions that are defined in the Conditions of Tendering or the Conditions of Contract have the meanings given to them in the relevant conditions.

If there is a conflict between these Special Conditions and the Conditions of Tendering and/or the Conditions of Contract, these Special Conditions will take precedence.

* 1. **INTERPRETATION OF TERMS**

Insert the following definition into Clause 2 of the Conditions of Contract:

**“‘Local Benefit Advisory Panel’** means a panel of Territorians established by the Minister responsible for Procurement to provide advice on Local Content and Local Benefit Commitments.“

* 1. **ASSIGNMENT AND SUB-CONTRACTING**

Clause 10 Assignment and Sub-Contracting is amended by the insertion of sub-clause 10.4 Sub-Contractor Protections:

**“10.4 Sub-Contractor Protections**

Where the total value of the head contract is $500 000 or greater and the total value of an individual sub-contract is $50 000 or greater, the following shall apply also:

1. Upon submission by the Contractor of a progress claim to the Principal, which includes works carried out by a sub-contractor in performance of the head contract, the Contractor shall provide to the Principal a declaration from the sub-contractor:
   1. Confirming payment of the sub-contractor’s previous tax invoice with supporting evidence; or
   2. Detailing the status of the dispute relating to the sub-contractor’s previous tax invoice if it is unpaid.
2. The declaration shall cover the period up to the date of the Contractor’s progress claim referred to in sub-clause (a).
3. Failure to submit a declaration, the submission of a false declaration, or the submission of a declaration under sub-clause (a)(ii) by the Contractor may result in:
   1. the preparation of the Contractor's Performance Report identifying failures; and/or
   2. the retention of any unpaid monies under (a)(ii) by the Principal out of the progress payment due to the Contractor; and
      1. where it is the subject of a dispute under the *Construction Contracts (Security of Payments) Act 2004* (NT), the Principal may pay the amount to the sub-contractor in accordance with the terms of the resolution of that claim once fully resolved and the amount shall be a debt due from the Contractor to the Principal.
      2. where it is the subject of a dispute otherwise than under the *Construction Contracts (Security of Payments) Act 2004* (NT), if any sub-contractor obtains a court order in respect of moneys referred to in this sub-clause (a)(ii) and produces to the Principal the court order and a statutory declaration that it remains unpaid, the Principal may pay the amount of the order, and costs included in the order, to the sub-contractor and the amount shall be a debt due from the Contractor to the Principal.”
   3. **LOCAL CONTENT**

Clause 16 Local Development is deleted in its entirety and replaced with the following:

**“16 Local Content**

**16.1 Local Benefit Commitment**

The Contractor acknowledges the Principal’s commitment to the development of business and industry in the Northern Territory.

In the Contractor’s Tender, the Contractor made certain promises and commitments with regard to the development of business and industry in the Northern Territory, to be achieved by the Contractor as part of this Contract. These promises and commitments form part of the Contract (and are referred to in the clauses below as the “Local Benefit Commitment”).

The Contractor shall comply with the Local Benefit Commitment.

**16.2 Use of Local Labour, Apprentices, Trainees and Supplies**

Without limiting Clause 16.1, the Contractor shall, except in those cases where the Contractor can reasonably demonstrate to the Principal that it is impractical for commercial, technical or other reasons so to do:

1. use labour, including indigenous labour, available within the Northern Territory;
2. use the services located and obtain supplies/materials available within the Northern Territory; and
3. use accredited apprentices/trainees who are registered in the Northern Territory on this project in accordance with the Contract:
   1. In complying with the use of accredited apprentices/trainees, the Contractor may:

* directly employ apprentices/trainees;
* utilise group training scheme apprentices/trainees;
* utilise sub-contractors apprentices/trainees;
* utilise any combination of the above.
  1. For contract value of $1 million and above one non-trade trainee may be substituted for a trade apprentice/trainee for the purpose of determining compliance with the Schedule of Minimum Number of Trainees.
  2. The Contractor’s level of compliance with this requirement will be taken into consideration for further Northern Territory Government contracts for a period of twelve (12) months.

**16.3 Reporting to the Principal and Right of Audit**

The Contractor shall, within seven (7) days of a written request by the Superintendent, submit a written report to the Superintendent detailing how it has complied or is complying with Clauses 16.1 and 16.2.

The Superintendent may, after giving seven (7) day’s written notice to the Contractor, inspect and conduct an audit of the Contractor’s records to determine the Contractor’s level of compliance with this Clause 16. The Superintendent may conduct this audit itself or may engage a third party to conduct the audit on the Superintendent’s behalf.

**16.4 Failure to Fulfil Local Benefit Commitment**

If the Contractor fails to fulfil or otherwise comply with the Local Benefit Commitment, or if the Contractor fails to comply with any other obligation placed on the Contractor by this Clause 16, the Principal may take action under Clause 63 (Default or Bankruptcy of Contractor).

**16.5 Performance to be reported in Contractor Performance Reports**

The Contractor’s compliance or non-compliance with this Clause 16 will be recorded in the Contractor Performance Report to be prepared by the Superintendent in accordance with Clause 68.”

* 1. **Indigenous Engagement**

Clause 17 Indigenous Development Plan is deleted in its entirety and replaced with the following:

**“17 INDIGENOUS ENGAGEMENT**

**17.1 Indigenous Development Plan**

1. Where an Indigenous Development Plan has been specified, the Contractor will maintain and implement the Indigenous Development Plan throughout the course of the Contract.
2. Within fourteen (14) days of award of Contract, the Contractor shall submit one copy of the Indigenous Development Plan to the Superintendent for approval. The Superintendent shall within a reasonable time from receipt, either approve the Indigenous Development Plan, or reject it, giving reasons for the rejections. The Contractor shall rectify the deficiencies and resubmit the Plan for approval.
3. The Contractor will be required to provide the Principal with a report on compliance (achievements against the objectives/goals) with the Indigenous Development Plan within thirty (30) days of the Completion of the Contract.

**17.2 Indigenous Employment Provisional Sum**

With all progress claims for payment, which include a claim against the Indigenous Employment Provisional Sum item identified in the Schedule of Rates, the Contractor shall provide a monthly Indigenous Employment Report incorporating:

1. a listing of all Indigenous persons employed by the Contractor and any Sub-Contractor in the performance of the Works;
2. pay sheets, signed by the participants, detailing hours worked and wages details relating to those Indigenous employees for whom a claim is being made for the period since the previous progress claim period and who are employed by the Contractor in the performance of the Works;
3. pay sheets, signed by the participants, detailing hours worked and wages details relating to those Indigenous employees for whom a claim is being made for the period since the previous progress claim period and who are identified as being employed by any Sub-Contractor in the performance of the Works accompanied by an invoice that reflects the claims;
4. a summary report of claims against the Indigenous Employment Provisional Sum from the commencement of the Works including the current monthly claims; and
5. details of any other subsidies received by or to which the Contractor or Sub-Contractor may be entitled for engaging Indigenous employees.”
   1. **VARIATIONS**

Clause 58.1 Variations is amended to include the following paragraph at the end:

“Without limiting the above the Superintendent may release information to members of the Local Benefit Advisory Panel before Local Benefit Commitments are varied.”

# Annexure TO CONDITIONS OF CONTRACT

|  |  |  |
| --- | --- | --- |
| 1 | All payments made under the Contract shall be made at:  *(Clause 1)* | Darwin  Northern Territory |
|  |  |  |
| 2 | The Principal is:  *(Clause 2)* | Northern Territory of Australia |
|  |  |  |
| 3 | The Superintendent shall be:  *(Clause 2)* | The person who is for the time being performing the duties of the General Manager Infrastructure Investment and Contracts Division |
|  |  |  |
| 4 | The basis of payment shall be:  *(Clause 3.1)* | Schedule of Rates |
|  |  |  |
| 5 | Adjustment for Rise & Fall is:  *(Clause 3.2)* | Not Allowed |
|  |  |  |
| 6 | The time for lodgement for the priced copy of the Bill of Quantities is:  *(Clause 4.1)* | Not Applicable |
|  |  |  |
| 7 | The amount of security is:  *(Clause 5.2)* | 1. Where the contract sum equals or exceeds $1,000,000.00: Security equivalent to 3% of the Contract sum, or 2. Where the contract sum is less than $1,000,000.00: Nil security. |
|  |  |  |
| 8 | The address of the Principal for service of documents is:  *(Clause 7.2)* | The Chief Executive  Department of Infrastructure, Planning and Logistics  PO Box 61 PALMERSTON NT 0831 |
|  |  |  |
| 9 | The address of the Superintendent for service of documents is:  *(Clause 7.2)* | Department of Infrastructure, Planning and Logistics  PO Box 61 Palmerston NT 0831 |
|  |  |  |
| 10 | An Indigenous Development Plan is:  *(Clause 17)* | Required |
|  |  |  |
| 11 | An Industry Participation Plan is:  *(Clause 18)* | Required |
|  |  |  |
| 12 | Building Code is:  *(Clause 19)* | Not Required |
|  |  |  |
| 13 | The value of materials to be supplied by the Principal is:  *(Clause 25)* | Not Applicable |
|  |  |  |
| 14 | The assessment for insurance purposes of architects, engineers, and surveyors fees is:  *(Clause 25)* | Not Applicable |
|  |  |  |
| 15 | The assessment for insurance purposes of the costs of demolition and removal of debris is:  *(Clause 25)* | Not Applicable |
|  |  |  |
| 16 | Limitation of Liability:  *(Clause 27)* | Not Applicable |
|  |  |  |
| 17 | The amount of Public Liability insurance shall be not less than:  *(Clause 28)* | $10,000,000 |
|  |  |  |
| 18 | The amount of Professional Indemnity insurance shall be not less than:  *(Clause 29)* | Not Required |
|  |  |  |
| 19 | Occupational Health and Safety Accreditation Scheme is:  *(Clause 33.1)* | Not Required |
|  |  |  |
| 20 | The time for giving possession of the site is:  *(Clause 42.1)* | Within 14 days of acceptance of tender |
|  |  |  |
| 21 | The time for Practical Completion of the works shall be:  *(Clause 53.2)* | Within 32 weeks of date of acceptance of tender |
|  | and, for each separable part of the Works: | Not Applicable |
|  |  |  |
| 22 | Liquidated Damages for the Works shall be:  *(Clause 53.5)* | $22,323.00 per week |
|  | and, for each separable part of the Works shall be: | Not Applicable |
|  |  |  |
| 23 | The Defects Liability Period for the Works shall be:  *(Clause 55)* | 104 weeks |
|  | and, for each separable part of the Works shall be: | Not Applicable |
|  |  |  |
| 24 | The amount of retention monies is:  *(Clause 60.1)* | Not Applicable |

# PRELIMINARY CLAUSES

## DESCRIPTION OF THE WORKS

The Works comprise the construction of flood mitigation works involving a new detention basin to store up to 95,000 cubic metres of floodwater and associated drainage infrastructure, including open drains and culverts, in order reduce the impact of flood waters on the Rapid Creek floodplain.

General works include the following activities:

* Project and Construction management;
* Implementation of the following management plans:
  + Quality
  + Safety
  + Environment
  + Traffic
* Obtaining all necessary permits and approvals;
* Clearing and grubbing and topsoil stripping and replacing on completed surfaces;
* Bulk and detailed earthworks, including cut and fill, importing and placing granular filter material, and disposal of excess excavated material;
* Blending and working selected excavated earth materials at controlled moisture contents to produce fill for a water retaining embankment;
* Drainage structures, including open drains, box culverts, headwalls and protection works using various concrete, rock, rock filled mattress and geotextile treatments;
* Protection works for shallow drain crossings of Power and Water Corporation sewers;
* Concrete Works including lining of one drain;
* Pavement construction;
* Kerbing and miscellaneous concrete works;
* Bituminous surfacing;
* Road Furniture, traffic control devices and pavement marking;
* Fencing;
* Landscaping, including dryland grassing, reinstatement of trees and shrubs and providing temporary irrigation water;
* Installation of advisory signs;
* Preparation of as-constructed drawings.

## SITE OF WORKS

The site of the Works includes three general locations as follows:

1. on a triangular section of land Section 4294 Hundred of Bagot on the corner of McMillans Rd and Henry Wrigley Drive, Marrara, where the main detention basin will be constructed;
2. within Section 5936 Hundred of Bagot, which is the site of the Netball court facility that is part the overall Marrara Sporting precinct, where the open drain is required to be constructed; and
3. within the Henry Wrigley Drive road reserve for the construction of new culverts

Some widening of existing drains will also be required to be carried out within Section 4295 Hundred of Bagot.

Where work is required to be carried out in easements or on land adjacent to the site for the purpose of connecting services or joining up of roads etc. ensure that the appropriate licences and approvals are obtained for work in those particular areas.

## EXISTING SERVICES AND STRUCTURES

Any connection, disconnection or interference with existing structures and services shall be carried out under the supervision of the Superintendent to whom reasonable notice shall be given by the Contractor of his intention.

Location of existing underground services and connection points shown on the drawings are approximate only. It is the Contractor’s responsibility to ensure that all existing underground services are located prior to commencement of excavation.

Contact and liaise with all relevant authorities to determine locations and depth of all existing services.

Where work is to be carried out within an existing road reserve contact the relevant road authority to confirm requirements, e.g. for line or thrust boring or open cut excavation, special provision for traffic, road opening permits, etc.

### Protection and Support of Existing Services and Structures

Provide support and protection for all existing structures and services which might be affected by the works but which are not required to be shifted. This includes, but is not limited to, trees, shrubs, water mains, electrical and Telephone/communications conduits, sewers, stormwater pipes, power poles, railway lines, retaining wall and buildings. Support includes all necessary measures, such as shoring, bracing and underpinning. If necessary to avoid damage to existing items or structures, excavated by hand instead of by machine.

Where existing items such as trees, walls, etc. but not services are damaged, restore or replace to their original condition.

Where it is necessary to have existing services diverted in order to construct the works, obtain the concurrence and approval of the Superintendent, then arrange the diversions with the appropriate authorities and pay all charges. Unless otherwise specified submit a claim for the cost of such diversions, supported by receipts from the appropriate authorities.

## restricted working hours

The work to be performed under the Contract shall be subject to execution within certain restricted working hours and the Contractor shall observe the following requirements:

* Removal of excess earthworks spoil off site will not be permitted during the hours 7:30am-8:30am and 4:30pm-5:30pm Monday to Friday
* While works can continue, no heavy vehicle traffic is to exit out of Section 3091 onto Abala Rd during Saturdays 7:00am to 7:00pm or Sundays 9:00am to 5:00pm for the entire project duration.

## site access requirements

Refer to Miscellaneous Provisions section 10.16.

## NOTICE BOARD

A notice board shall be erected in a location approved by the Superintendent, and in accordance with the ROAD FURNITURE AND TRAFFIC CONTROL DEVICES Section. Refer to MISCELLANEOUS PROVISIONS Section 10.10.

## SURVEYS AND SETTING OUT

The Contractor shall be responsible for all setting out required for the proper execution of the Works. The design lines have not been pegged. Survey stations sufficient to establish the design line have been placed at the coordinates and levels shown in the drawings.

Prior to setting out the Works the Contractor shall verify the assigned coordinates and levels of all control stations. Differences outside the tolerances listed below, along with an assessment of the possible source of the problem and a proposed solution, shall be reported to the Superintendent for resolution, acceptance or guidance as to the method to be used for minimising or correcting adverse effects.

The precision of the x, y and z values of an adjacent control mark, as determined from the occupied control mark, are not to exceed the greater of the following:

x : ± 5 mm or ± 25 ppm

y : ± 5 mm or ± 25 ppm

z : ± 12 mm **√**kilometre

The Contractor shall take care not to disturb or cause any damage to land survey pegs and he shall be responsible for the payment of all fines, legal expenses, cost of re-erection and any other claims arising

**Survey Pegs**

Install temporary survey pegs along the extent of the works to the extent necessary to control conformance of the works.

The survey pegs are to be installed in close proximity to the edge of works but still provide clearance for plant and equipment to be used without damaging or moving the survey pegs.

Individual survey pegs are to be tied with high visibility flagging tape.

The survey pegs are to be marked with the design relative level of the works and a description of the location or chainage at which each survey peg is located. This information must be clearly legible throughout the duration of works.

Any survey pegs which are damaged must be repaired or replaced and reinstated in their correct positions as soon as practicable.

Any survey pegs moved but not damaged must be reinstated in their correct positions as soon as practicable.

## SCHEDULE OF DRAWINGS

The following drawings shall form part of the Contract.

|  |  |  |
| --- | --- | --- |
| **DRAWING NO.** | **AMEND NO.** | **SUBJECT** |
| R16-4547 | 0 | Locality plan and drawing schedule |
| R16-4548 | 0 | Notes |
| R16-4549 | 0 | General arrangement site plan |
| R16-4550 | 0 | Detention basin plan sheet 1 of 3 |
| R16-4551 | 0 | Detention basin plan sheet 2 of 3 |
| R16-4552 | 0 | Detention basin plan sheet 3 of 3 |
| R16-4553 | 0 | Detention basin longitudinal sections control lines 1 & 2 |
| R16-4554 | 0 | Drain longitudinal sections and typical cross sections Sheet 1 of 2 |
| R16-4555 | 0 | Drain longitudinal sections and typical cross sections Sheet 2 of 2 |
| R16-4556 | 0 | Detention basin typical sections |
| R16-4557 | 0 | Culvert sections sheet 1 of 2 |
| R16-4558 | 0 | Culvert sections sheet 2 of 2 |
| R16-4559 | 0 | Detention basin details |
| R16-4560 | 0 | Details sheet 1 of 4 |
| R16-4561 | 0 | Details sheet 2 of 4 |
| R16-4562 | 0 | Details sheet 3 of 4 |
| R16-4563 | 0 | Details sheet 4 of 4 |
| R16-4564 | 0 | Culvert inlet/outlet details sheet 1 of 2 |
| R16-4565 | 0 | Culvert inlet/outlet details sheet 2 of 2 |
| R16-4566 | 0 | Landscaping plan |
| R16-4567 | 0 | Earthworks |
| R16-4568 | 0 | Culvert 1 and 3 – Apron slab, headwall and wingwall structural details sheet 1 of 2 |
| R16-4569 | 0 | Culvert 1 and 3 – Apron slab, headwall and wingwall structural details sheet 2 of 2 |
| R16-4570 | 0 | Culvert 2 – Apron slab, headwall and wingwall structural details sheet 1 of 2 |
| R16-4571 | 0 | Culvert 2 – Apron slab, headwall and wingwall structural details sheet 2 of 2 |
| R16-4572 | 0 | Culvert 4 – Apron slab, headwall and wingwall structural details sheet 1 of 2 |
| R16-4573 | 0 | Culvert 4 – Apron slab, headwall and wingwall structural details sheet 2 of 2 |
| R16-4574 | 0 | Culvert 5 – Apron slab, headwall and wingwall structural details sheet 1 of 2 |
| R16-4575 | 1 | Culvert 5 – Apron slab, headwall and wingwall structural details sheet 2 of 2 |
| R16-4576 | 0 | Culvert 1 and 3 - Inlet screen plan and details |
| R16-4577 | 0 | Culvert 4 – Inlet screen plan and details |
| R16-4578 | 0 | Culvert 5 – Inlet screen plan and details |
| R16-4579 | 0 | Culvert 1 Inspection pit structural details |

|  |  |  |
| --- | --- | --- |
| **DEPARTMENT OF INFRASTRUCTURE PLANNNING AND LOGISTICS** | | |
| **SITE ACCESS DRAWING NO.** | **AMEND NO** | **SUBJECT** |
| R17-1402 | 0 | Construction Access Requirements – Sheet 1 Marrara Drain and Rapid Creek Detention Basin |
| R17-1403 | 0 | Construction Access Requirements – Sheet 2 Marrara Drain and Rapid Creek Detention Basin |
| R17-1404 | 0 | Construction Access Requirements – Sheet 3 Marrara Drain and Rapid Creek Detention Basin |
| **STANDARD DRAWING NO.** | **AMEND NO.** | **SUBJECT** |
| CS-0451 | 0 | NTG BRANDING SIGNAGE NTG FUNDED BUILDINGS |
| CS-1123 | 1 | PRECAST REINFORCED CONCRETE BOX CULVERTS – 1200 X 450 mm to 900 mm RCBS’s FLOOR AND ENDWALL DETAILS |
| CS-1203 | 3 | STANDARD KERB PROFILES |
| CS1305 | 3 | PEDESTRIAN FENCE |
| CS1306 | 5 | STOCKFENCE DESIGN AND DETAILS |
| CS1520 | 4 | LINE MARKING |
| CS1844 | 0 | NORTHERN TERRITORY GOVERNMENT PROJECT INFORMATION SIGN |

## DRAWINGS FOR INFORMATION

The following drawings are made available for the information of Tenderers; they shall not form part of the Contract.

|  |  |  |
| --- | --- | --- |
| **DRAWING NO.** | **AMEND NO.** | **SUBJECT** |
| SK001 | 0 | EROSION AND SEDIMENT CONTROL PLAN |
| SK002 | 0 | EROSION AND SEDIMENT CONTROL NOTES AND DETAILS |
| **INTERNATIONAL EROSION CONTROL ASSOCIATION, AUSTRALIASIA** | | |
| CD-01 | Dec 09 | CATCH DRAINS |
| CD-02 | Dec 09 | CATCH DRAINS – EARTH LINED |
| SF-01 | Dec 09 | SEDIMENT FENCE |
| SF-02 | Apr 10 | SEDIMENT FENCE |
| RCD-01 | Dec 09 | CHECK DAMS |
| SD-EXIT-04 | Dec 09 | CONSTRUCTION EXIT – VIBRATION GRID |
| SD-EXIT-05 | Apr 10 | CONSTRUCTION EXIT – VIBRATION GRID |
| SD-SW-3 | May 10 | SEDIMENT WEIR (INSTREAM) |
| SD-SW-4 | May 10 | SEDIMENT WEIR (INSTREAM) |

## INTERPRETATION OF DRAWINGS

The Contractor shall check all relevant dimensions on site before proceeding with the work under the Contract.

The layout of plant and equipment as shown on the drawings shall be taken as diagrammatic only and all measurements and other information required to carry out the Works specified shall be obtained by the Contractor on the site. No claim for extras arising from failure to obtain measurements and other information on site will be recognised.

## GEOTECHNICAL INFORMATION

The following reports are made available for the information of Tenderers. They shall not form part of the Contract.

|  |  |
| --- | --- |
| **REPORT NO.** | **SUBJECT** |
| 78245.00.R.001 | “Factual Report on Geotechnical Investigation, Proposed Flood Mitigation Works. Rapid Creek, NT” March 2016 Douglas Partners |
| IW110800.1-CG-RPT-0001\_0 | “Rapid Creek Flood Mitigation Works. Department of Infrastructure. Geotechnical Report”. March 2016 (B).  Jacobs |

The reports have been prepared for purposes of design and documentation of the project but are not intended to be a complete and exhaustive statement of all relevant material on the particular topics referred to therein.

Without limiting the generality of the provisions of the Conditions of Contract, the reports referred to above are provided on the basis that each Tenderer shall inform himself of all particulars concerning the performance of every part of the Works contained in the Technical Specification, which includes the plans, according to the specific terms and conditions referred to therein and acknowledge that he has not relied upon the Principal, his agents, employees or consultants to assemble and transmit such information.

## DESIGN SAFETY REPORT

A design safety report is made available to Tenderers for the purposes of assessing any hazards associated with the design. It is provided as reference material only and does not form part of the Contract. It is not intended to be a complete and exhaustive statement of all relevant material contained therein.

Without limiting clause 13 of the Conditions of Contract, the report is provided on the basis that each Tenderer shall inform himself of all particulars concerning the performance of every part of the Works contained in the Technical Specification, which includes the plans, according to the specific terms and conditions referred to therein and acknowledges that he has not relied upon the Principal, his agents, employees or consultants to assemble and transmit such information.

## NATURE OF EXCAVATIONS

The Contractor shall be deemed to have judged for himself the nature of the material to be excavated and to have made due allowance in his tender for excavation in material of whatever nature may be encountered.

No cost variation will be considered regardless of nature of material encountered.

## DIAL BEFORE YOU DIG

Dial Before You Dig (DBYD) is a community service that provides information on underground pipes and cables from all underground service providers in the area. There is no cost to the user for this service; however, some asset owners reserve the right to make a modest charge for some plans.

Contact DBYD at least 2 working days before you plan to excavate and obtain the plans of the underground services before commencing excavation.

Provide a written notice to the Superintendent stating that the plans have been received and include the DBYD sequence number.

DBYD can be contacted at the following numbers:

Telephone: 1100 8am to 5pm weekdays, excluding public holidays

Internet: [www.1100.com.au](http://www.1100.com.au)

## PROTECTION OF TELECOMMUNICATION UNDERGROUND CABLES

In addition to the requirements of the clause titled “Dial Before You Dig”, and prior to commencing any excavation, boring of holes, blasting, rock breaking, soil compaction or similar activity in the vicinity of telecommunication underground cables, whether fibre optic or copper, the Contractor shall obtain the location of the cables from the accredited plant locater, and pay all fees.

The Contractor shall follow all directions and instructions issued by the owner of such telecommunication underground cables in relation to work in the vicinity of such cables.

## Work in the Vicinity of Power and Water Assets – hold point

**Hold Point** - Prior to commencing work in the vicinity of any sewerage system, high voltage cable or power line or other high voltage structure, the Contractor shall contact Power and Water and obtain and become cognisant with written guidelines or procedures setting out safe practices for working in or adjacent such hazardous areas.

Whilst working in the vicinity of sewerage systems, high voltage cables or power lines or other high voltage structures the Contractor shall follow all directions and instructions issued by Power and Water.

### Overhead Power Lines

Carry out work in accordance with the requirements of Work Health. Do not permit any part of construction plant such as an excavator or crane or any part of a load carried by such plant to come closer than 3m from the power line conductors. At all times when such plant is in operation below or within 6m of overhead lines, position an observer whose sole duty is to provide advice to the operators regarding proximity of the lines and to give warning to the operators regarding the proximity of the lines and to give warning of potential breaches of required clearance guidelines.

Refer to Work Health Information Bulletins

## LIGHT AND POWER

The Contractor shall install any temporary electric light and power installations, including metering, required for executing the work under the Contract all in accordance with the relevant regulations, and shall pay all costs and charges in connection with the installation and use of such services.

## WATER

The Contractor shall arrange for the supply of all water required for executing the Works under the Contract and pay all incidental charges, including cost of water so used.

Power and Water have indicated three potential water source locations, of these three only one would be permitted as a source to supply water for the project and would be subject to limited supply. Refer to Department of Construction and Infrastructure Site Access Drawings for potential water source locations.

## SANITARY ACCOMMODATION

The Contractor shall provide adequate and clean sanitary accommodation for use of all persons employed upon the Works and clear away and remove such accommodation from the site on completion of the Contract.

## WORK WITHIN THE ROAD RESERVE

Before any work is carried out within a road reserve by the Contractor or its Sub-Contractors, the Contractor shall apply to the appropriate authority for permission to work within the road reserve and where relevant, permission to open the road. The Contractor shall pay the necessary fees, and shall conform to the requirements of that authority.

The relevant part of Henry Wrigley Drive is in the care of the NT Government Department of Infrastructure Planning and Logistics.

The relevant part of Abala Road is in the care of City of Darwin.

## ABSTRACT OF PROVISIONAL QUANTITIES AND MONETARY PROVISIONS

(a) NOMINATED SUB‑CONTRACTORS

NIL

(b) PROVISIONAL QUANTITIES

|  |  |  |
| --- | --- | --- |
| **Description** | **Quantity** | **Clause Number** |
| RELOCATE CYCADS | 50 No. | 24.1.4 |
| UNSUITABLE MATERIAL BELOW SUBGRADE SURFACE OTHER THAN ROCK | 500 m3 | 24.6.3 |
| UNSUITABLE MATERIAL BENEATH FILLS | 500 m3 | 24.6.6 |
| FILLING OF CRAB HOLES IN SUBGRADE | 20 m3 | 24.6.8 |

(c) OTHER PROVISIONAL SUMS

|  |  |  |
| --- | --- | --- |
| **Description** | **Value ($)** | **Clause Number** |
| INDIGENOUS EMPLOYMENT PROVISIONAL SUM | $800,000 | 3.4 |

# INDIGENOUS DEVELOPMENT PLAN

## GENERAL

This section specifies the requirements for the Indigenous Development Plan (IDP) for this project. The Contractor is responsible for ensuring the provisions of this section of the Contract and any other associated requirements (eg *Fair Work Act*) are complied with.

Details addressing key elements of the proposed IDP are to be given in the Response Schedule. Sufficient detail is to be provided that will allow overall assessment of the intent of the proposed IDP.

A fully developed Plan will be required within fourteen (14) days of Contract award.

## PRINCIPLES

The purpose of the IDP for this Contract is to develop strategies and protocols within the contract that support Indigenous enterprise and maximise employment and training opportunities for Indigenous Territorians.

This could be achieved through adopting the following principles:

1. Employment and contract opportunities packaged to suit Indigenous people and organisations from within the local region.
2. Strategies to maximise the recruitment and retention of indigenous people.
3. Use of employment brokers and agencies set up to support indigenous employment.
4. Harness existing labour market programs and other government policy mechanisms.
5. Identify the skills gap and workskill development requirements of the Contract to appropriate Registered Training Organisations (RTO).
6. Ensure RTOs deliver appropriate training which supports indigenous workforce growth.
7. Support local businesses that employ Indigenous Territorians.
8. Ensure all subcontractors equally adopt these principles.

## Indigenous Employment Provisional Sum

The NT Government is committed to providing opportunities to develop employment outcomes for Indigenous Territorians. An Indigenous Employment Provisional Sum has been identified for the Works to support the employment of Indigenous employees including apprentices/trainees to be employed on the Works. The Schedule of Rates identifies the Provisional Sum applicable to the Works.

No payment to the Contractor against the Indigenous Employment Provisional Sum will be made beyond the amount identified in the Schedule of Rates as ‘Indigenous Employment Provisional Sum’ without prior written authority from the Principal.

Claims against the Indigenous Employment Provisional Sum must be accompanied by an Indigenous Employment Report (Clause 3.4).

## INDIGENOUS DEVELOPMENT PLAN (IDP)

### Submission – Hold Point

Within fourteen (14) days of the award of Contract, and before any work commences on site, the Contractor shall submit to the Superintendent one copy of the finalised IDP for approval.

The Superintendent shall within a reasonable time from receipt either approve the Indigenous Development Plan, or reject it, giving reasons for the rejections. The Contractor shall rectify the deficiencies and resubmit the Plan for approval.

### Minimum Requirements

The IDP as a minimum must address the following topics:

1. General Overview
   1. Provide an outline of the Indigenous participation context.
   2. Provide an opportunity analysis for local participation.
   3. Nominate the Contractor’s representative with responsibility for the Plan.
2. Employment Strategy and Targets
   1. Identify sources for indigenous labour (eg employment agency(s)/ indigenous organisation(s) etc.).
   2. Nominate employment targets and conditions of employment to be offered (compliance with Fair Work Act requirements).
   3. Nominate the intended balance of skilled and unskilled indigenous labour to be achieved.
   4. Numbers of apprentices and trainees to be employed.
   5. Career management strategies.
   6. Mentoring strategies.
   7. Strategies to sustain indigenous employment through the entire period of the Contract.
3. Training Strategies and Programs
   1. Training needs analysis, identifying skill gaps and work-skill development pathways.
   2. Nominate the intended RTO and accredited courses to be delivered.
   3. Proposed training schedule, including mix of classroom and on-the-job training, demonstrating total hours expected.
   4. Identify any external funding to be sourced from DEEWR or DET to supplement delivery costs.
4. Local Development Capacity and Opportunities
   1. Identification of opportunities for local Community participation.
   2. Specific proposals to maximise local Community involvement.
   3. Goods, services and materials that will be locally sourced.
   4. Use of sub-contractors that also use strategies that maximise indigenous employment.
   5. What recognised quality assurance/project control certification will be required of local sub-contractors.
5. Consultation and Communication Protocols
   1. Extent of community engagement to ascertain the availability of potential indigenous workers, including sub-contractors, labourers, cadets and apprentices/trainees etc.
   2. How the Contractor will communicate such opportunities (employment/training/supplies/sub-contractors) available during the Contract.
6. Monitoring/Auditing and Reporting Protocols
   1. Maintain a system for recording and reporting. Monthly reports will be required however the Superintendent may seek reports on a more frequent basis during the Contract period.
   2. Adopt and maintain a system for the following:

* recording the weekly Indigenous employment hours worked and signed by the participants weekly;
* recording Indigenous training hours;
* detailing training courses/modules scheduled and completed; and.
* providing a monthly Indigenous Employment Report, as per the reporting template provided, incorporating:

1. a listing of all Indigenous persons employed by the Contractor or who are identified as being employed by any Sub-Contractor in the performance of the Works;
2. pay sheets, signed by the participants, detailing hours worked and wages details relating to those Indigenous employees for whom a claim is being made for the period since the previous progress claim and who are employed by the Contractor in the performance of the Works;
3. pay sheets, signed by the participants, detailing hours worked and wages details relating to those Indigenous employees for whom a claim is being made for the period since the previous progress claim and who are identified as being employed by any Sub-Contractor in the performance of the Works accompanied by an invoice that reflects the claims;
4. a summary report of claims against the Indigenous Employment Provisional Sum from the commencement of the Works including the current monthly claims; and
5. details of any other subsidies received by or to which the Contractor or Sub-Contractor may be entitled for engaging Indigenous employees.

## PROJECT REPORTING

A report at the completion of Works is to be provided to the Superintendent. The report should address as a minimum:

* + - * 1. General compliance with endorsed IDP objectives.
        2. Employment compliance (achievements against objectives/goals).
        3. Training compliance (achievements against objectives/goals).
        4. Lessons learned.

# QUALITY ASSURANCE

## GENERAL

### Outline

The Contractor shall establish, document, implement and maintain a project quality system, which meets the requirements of this Contract. In developing the project quality system, the Contractor shall ensure that the requirements of those elements of AS/NZS ISO 9001:2000 – Quality Management Systems that are included in this Contract are also met.

The project quality system shall be described in a series of documents. As a minimum, these documents comprise a project quality plan, procedures, Inspection and Test Plans (ITP's) and quality records. The Contractor shall apply these throughout the course of the Contract to ensure that work complies with the requirements of this Contract.

Failure to establish, document, implement and maintain a project quality system in accordance with this Contract shall be deemed to be a default by the Contractor under the General Conditions of Contract.

Notwithstanding any statements to the contrary in any part of this Contract or the Project Quality System documentation, the Contractor shall not use any part of the Project Quality System to pre-empt, preclude or otherwise negate the technical requirements of the Contract. Acceptance of the Quality System in no way relieves the Contractor of responsibility to comply with the requirements of the Contract.

### Definitions

|  |  |
| --- | --- |
| ASSESSMENT | An examination of the Contractor's quality system documentation to ensure that it meets the requirements of the Contract. |
|  |  |
| QUALITY AUDIT | An examination of records to evaluate whether established methods and procedures, as described in the quality system documentation, are being adhered to and the necessary records maintained. |
|  |  |
| CONTRACTOR | The supplier who undertakes to supply works and/or services as provided by the Contract. |
|  |  |
| HOLD POINT | A point in the process beyond which work may not proceed without written authorisation by a designated person or authority. |
|  |  |
| INSPECTION AND TEST PLAN | An ITP is a document which, for a particular process or activity, plans and describes what checks for compliance with the Contract are to be made. These checks are made at the start of, during, and on completion of the activity. |
|  |  |
|  | ITP's are required for each work activity, and for each lot or batch. |
|  |  |
| LOT | A quantity of work which has been produced under conditions which are essentially the same and essentially in the same time frame. |
|  |  |
| PROCEDURE | A method for undertaking a certain activity, incorporating a clear allocation of the responsibilities for accomplishing the key tasks, duties or actions involved. |
|  |  |
|  | A procedure may be referred to as a system procedure, i.e., one relating to the operation or maintenance of the quality system; or a technical procedure, i.e., one describing a works or services related activity. |
|  |  |
| PRODUCT | The result of activities or processes. A material, part, item, component, assembly, sub-assembly, structure, plant, equipment or finished product identified or described in the Contract. |
|  |  |
| PROCESS | A set of inter-related activities, which transform inputs into outputs. |
|  |  |
| PROCESS CONTROL | Monitoring and control of process parameters to ensure compliance with specified requirements, including necessary intermediate testing of the product. |
|  |  |
| PROJECT QUALITY PLAN | The project quality plan provides an overview of how the work under the Contract will be performed and controlled. |
|  |  |
|  | It sets out the specific quality objectives; details of the project management organisation, responsibilities and authorities; and lists the procedures relevant to the Contract. |
|  |  |
| PROJECT QUALITY SYSTEM | The organisational structure, procedures, processes and resources needed to manage and control a project and the work |
|  |  |
| QUALITY MANAGEMENT REPRESENTATIVE (QMR) | The Contractor's management representative responsible for the implementation and maintenance of the project quality system. |
|  |  |
| QUALITY RECORDS | Documents, which furnish objective evidence of activities, performed and result achieved. Records can be written or stored on any data medium. |
|  |  |
| RESERVED | Identifies that the corresponding clause in ISO 9001 is not a mandatory requirement for the Contract. |
|  |  |
| SUPPLIER | The Contractor. |
|  |  |
| WITNESS POINT | A point in a process or activity of which the Superintendent or his representative must be advised in advance. A Hold Point nominated by the Contractor will be deemed to be a Witness Point for the Superintendent. |

## QUALITY ASSURANCE REQUIREMENTS

### At Submission of Tender

Appoint a Quality Management Representative (QMR). The QMR shall have experience of on-site work of similar magnitude or complexity, and shall have an understanding of the principles and practices of quality assurance.

Submit for assessment, as part of the tender, a Project Quality Plan Proposal.

### Prior to Commencement of Work - Hold Point

Hold Point: Prior to establishment and commencement of work on and off site, submit for assessment 1 copies of:

(a) The project quality plan (see Clause 7.3 for details of the requirement).

(b) Documented procedures relevant to the Contract (see Clause 7.4 for details of the procedures required).

Before permission to use is given, these documents will be assessed by the Superintendent for conformance with the requirements of the Contract.

After permission to use is given, submit 1 controlled copies of the above quality documents for use by the Superintendent during the Contract.

### During the Contract - Hold Point

Hold Point: Provide current issues of Inspection and Test Plans (ITP) to the Superintendent, for permission to use, 10 working days prior to work commencing on that particular lot, trade, construction element or service.

Hold Point: Do not commence any manufacturing or construction activity until permission to use the project quality plan, procedures and ITP's provided is obtained in writing from the Superintendent's Representative.

Review the Quality System continuously during the course of the Contract. Any agreements reached between Contractor and the Superintendent which affect quality management should be included as an update to the Project Quality Plan, e.g., the form and nature of verification packages.

Conduct internal and external quality audits in accordance with the audit schedules.

Submit proposed amendments to the quality system to the Superintendent for permission to use.

## PROJECT QUALITY PLAN

### Minimum Requirements

As a minimum, include in the project quality plan:

(a) A description of the organisational structure for the management of the project with details of the specific responsibilities and authorities of key personnel. Include how the management system is reviewed.

(b) The Contractor's quality objectives for the project.

(c) The name of the proposed Quality Management Representative (QMR) and details of qualifications and experience. Include details of the QMR's responsibilities and authority to resolve quality matters.

(d) A register of Technical Procedures and Inspection and Test Plans (ITP's) applicable to the Contract, giving the title, identifier and revision status of each. Include a sample ITP.

(e) A similar register of system procedures related to those elements of AS/NZS ISO 9001 that are included in Clause 7.4 of this Contract.

(f) The method of notification of all off-site manufacturing and testing, including materials testing.

(g) Schedules of external and internal quality audits planned during the Contract period.

## QUALITY SYSTEM REQUIREMENTS

### Management Responsibility

This requirement is covered in 7.3.1 above.

### Quality System

The quality system for the project is defined by this Contract.

### Contract Review

Provide documented procedures for Contract review, including recording of results.

### Design Control

Reserved

### Document and Data Control

Provide documented procedures for the control of all documents and data relating to the Contract, including Contract documents issued by the Superintendent.

Maintain all controlled copies of project documents at the current approved revision status.

Maintain on site a copy of the relevant Australian Standard on which the quality system is modelled.

Ensure ready access to all relevant codes of practice, test methods and standards referred to in the Specification.

### Purchasing

Provide documented procedures for the evaluation and selection of sub-contractors

Engage only sub-contractors who are accredited to perform works and services for the Territory to the level specified by the task.

Prepare and maintain an up-to-date register of sub-contracts, describing the scope of works in each sub-contract, each sub-contractor's name and address, accreditation category and sub-category for sub-contracts of $50,000 or more, and where applicable the name of each sub-contractor's QMR.

Detail the methods used to ensure the quality of products or services purchased from sub-contractors and suppliers, including procedures for verification and recording.

The Superintendent may verify at source or upon receipt that a purchased product conforms to specified requirements. Provide access and co-operation and all necessary documentation for the Superintendent to carry out the verification. This clause applies also to any laboratory used for conformance testing.

### Control of Customer Supplied Product

Provide documented procedures for the control of any material or item supplied by the Principal for use in the execution of the Contract.

### Product Identification and Traceability

Provide documented procedures for identifying work as numbered lots. Use these lot numbers as identifiers on relevant quality records.

Each lot number is to be identifiable in the field/on site.

Identify all samples and test results with the precise location in the works to which they relate.

Traceability is not required for works under this Contract.

### Process Control

Provide documented procedures for all Construction activities required to carry out the work under this Contract.

Include procedures for:

1. Embankment Earthworks, including procedure for achieving required compaction
2. Filter Toe and Filter Diaphragm Construction
3. Culvert Construction
4. Opening and Reinstating Roads

Include in the relevant procedures those specific activities for the Superintendent’s information or requiring the Superintendent’s direction.

Include in the relevant procedures, inspection and Test Points and Hold Points and indicate where they occur.

Ensure only qualified and competent personnel are used and that, records of their qualifications are maintained.

### Superintendents Quality Audits

The Superintendent will carry out all conformance testing. Conformance Testing, when required, is to be ordered directly by the Contractor from the Panel Period Contractors, however, the Superintendent retains the right to order testing at any time.

Should the Contractor wish to undertake additional testing, then the Contractor shall arrange and pay for those tests.

Ensure personnel with suitable qualifications and experience undertake all quality control field tests. Maintain records of such personnel.

Establish and maintain records of all inspection and testing conducted.

he Panel Period Contractor will provide the Superintendent and the Contractor simultaneously with records of conformance testing nominated as the Superintendent's responsibility.

Prepare and document Inspection and Test Plans (ITP’s) which describe the inspections, tests and verifications for each stage of the works. Include details of sampling plans and detail the frequency of process control testing. Or in the case of a period contracts, describe in documented procedures how verification of compliance with the specification is demonstrated for completed work.

As a minimum, include ITP’s for:

1. Embankment Earthworks
2. Filter Toe and Filter Diaphragm Construction
3. Culvert Construction
4. Opening and Reinstating Roads

The following information is to be included in ITP's:

1. date;
2. product concerned;
3. name of sub-contractor, if applicable;
4. when sub-contractors' ITP's are required, verification of their compliance with the specified requirements;
5. where each inspection and test point is located in the process;
6. who carries out the inspection or test;
7. characteristics to be tested;
8. method of inspection or test;
9. specified acceptance criteria;
10. Hold Points and Witness Points;
11. where lots or batches will be used;
12. form of record of results;
13. frequency and timing of the test; and
14. details of what is to be inspected.

### Control of Inspection Measuring and Test Equipment

Provide documented procedures for the calibration and maintenance of any device or equipment used to demonstrate that specified requirements are being met.

Measuring and test equipment shall include survey instruments and measuring equipment.

Inspection, measuring and test equipment shall be capable of producing the degree of accuracy required by the Contract.

For laboratory testing equipment, NATA certification will be accepted as satisfying the requirements of the Contract.

Maintain a schedule of calibration of such equipment to be used on the works, giving dates of the last, and next due, calibrations. Provide evidence of current calibration.

### Inspection and Test Status

Provide documented procedures, which describe how the results of inspection and tests of the work are identified and recorded.

### Control of Nonconforming Product

Provide documented procedures for handling material or work that does not meet specified requirements, and for defects in the quality management system.

Ensure that defective material or work is not used or installed.

Define in the procedures who is responsible for reviewing defects and who has the authority to decide what remedial action is to be taken.

Develop standard pro-forma (Non-conformance Report) for use in recording details of defects and the remedial action taken.

Raise a report of any defective work, or any defect related to the quality system, within one working day of the non-conformance being recognised.

The responsibility for deciding on remedial action rests with the Contractor. If that proposed action does not involve an amendment to the Contract, and will not result in a variation or extension of time to the Contract, the Contractor is also responsible for taking that action.

If amendment or variation or extension of time will result from the proposed remedial action, submit the non-conformance report with the proposed action to the Superintendent for approval. Such a non-conformance constitutes a Hold Point.

Maintain an up-to-date register of non-conformance reports, including action taken. Ensure the register is available to the Superintendent at all times.

In the event of the Superintendent observing defective work or a defect in the quality system, the Contractor will be advised in writing. Within one ordinary working day of receipt of the advice, the Contractor shall raise a non-conformance report and action it in accordance with this Clause.

### Corrective and Preventative Action

Provide documented procedures describing the action to be taken to eliminate or minimise recurring problems and how that action is implemented and recorded.

Maintain records of corrective and preventative action carried out, including confirmation of the effectiveness of such actions.

### Handling, Storage, Packaging, Preservation and Delivery

Provide documented procedures describing the controls to prevent loss, damage or deterioration of products and material to be incorporated into the work or service.

Provide details of any special packaging or preservation requirements for any stage of the work or during delivery of product or materials.

Provide details of proposed means of disposal of all material used for storage, preservation and packaging.

### Control of Quality Records

Provide documented procedures describing how quality records are identified, controlled, maintained, stored and disposed of.

Quality records shall include, as a minimum:

(a) Records of management reviews

(b) Records of contract and tender reviews

(c) Purchase orders

(d) Registers of sub-contractors

(e) Records of sub-contractor performance

(f) Delivery Dockets

(g) Invoices

(h) Completed ITP’s

(i) Test Results

(j) Supplier’s and sub-contractor’s compliance certificates

(k) Calibration schedules

(l) Non-conformance reports

(m) Records of corrective and preventative action

(n) Records of audits

(o) Training records

### Internal Quality Audits

Provide documented procedures describing how internal quality audits are planned, implemented and recorded. Maintain records of the results of internal quality audits, including the effectiveness of any resultant corrective action taken.

Prepare an audit schedule, submit it for assessment, and implement it when permission to use is given. Conduct internal quality audits at least every four weeks with the first within two weeks of the commencement of work. Each internal audit may cover only part of the quality system.

### Training

Provide documented procedures describing how training needs are identified and training provided for all personnel performing activities affecting quality. This includes the use of the quality system.

Maintain appropriate records.

### Servicing

If servicing and warranty, including during a defects liability period, is a requirement of the Contract, provide documented procedures describing how servicing is performed and recorded.

Prior to expiry of the defects liability period, provide to the Superintendent, evidence that all outstanding items, raised prior to practical completion, or raised during the defects liability period, have been finalised.

## additional requirements

### Superintendents Quality Audits

The Superintendent shall monitor and audit the Contractor's Quality System. The Superintendent shall have the same rights of access to sub-contractors' Quality Systems as the Contractor.

Quality audits will generally be scheduled for every two calendar months. At least five working day’s notice of a scheduled audit shall be given to the Contractor. The Principal reserves the right to conduct unscheduled quality audits with a minimum of one working day's notice.

Quality audits will be conducted in accordance with the Superintendent's procedures, using suitably trained and competent staff.

The Contractor shall provide access and co-operation and all necessary documentation to allow the audit team to conduct the audit.

For the purpose of conducting a quality audit, the Superintendent may direct the opening up or pulling down of any part of the work under the Contract, the cost of which shall be in accordance with the provision of the General Conditions of Contract.

Corrective action requests resulting from an audit shall invoke a Hold Point unless they are related to system non-conformances, which do not directly affect product or service quality.

### Hold Points and Witness Points

To ensure compliance with critical aspects of the Contract, Hold Points and Witness Points have been identified for which the Superintendent is the designated person in accordance with "Definitions". Provide the Superintendent with 24 hours’ notice of the requirement to release a Hold Point. Provide the Superintendent with 24 hours’ notice of reaching a Witness Point.

When a Hold Point, for which the Superintendent is the designated person, has been reached, the Contractor shall submit relevant documentation associated with it to the Superintendent.

A Hold Point shall apply on detection of all nonconforming work for which the Contractor proposes to seek dispensation from the Superintendent for acceptance by concession.

Hold Points required by the Superintendent are given in Schedule 1 and elsewhere in the Contract Documents. Those points which are identified by words such as "to approval" and "permission to use” are to be treated as Hold Points for which the Superintendent is the designated person.

Witness Points required by the Superintendent are given in Schedule 2 and elsewhere in the Contract Documents.

### Cost of the Quality System

The Contractor shall bear all costs associated with the development, documentation, implementation and maintenance of the Quality System. The cost of the Quality System, including the costs of all investigations and testing, shall be deemed to be included in the rates or prices generally for the works.

The Contractor shall have no claim against the Principal for costs incurred in providing staff or interruption of works for any audit activity.

# HOLD POINTS AND WITNESS POINTS SCHEDULES

## SCHEDULE 1 - hold POINTS

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# ENVIRONMENTAL MANAGEMENT

## GENERAL

Environmental Management principles apply to all construction and demolition projects for building works and for civil works carried out by or on behalf of the Northern Territory Government (NTG).

## STANDARDS

The Standard Specification for Environmental Management reference text is the document which prescribes the minimum standards for environmental management for NTG projects.

This document is available from the web as a PDF document at:

<https://infrastructure.nt.gov.au/specification-services/technical-specifications/environmental-management>

If there is any inconsistency between the Standard Specification for Environmental Management reference text and any other document prescribing environmental management procedures applicable to the project; refer the inconsistency to the Superintendent immediately, and assume that the more stringent requirements apply until and unless advised differently by the Superintendent.

## REFERENCES

Only the clauses which are appropriate for the works are applicable to the works being carried out under this contract. Variations to the specification, if any, appear in clause titled Environmental Management Specific Requirements below.

## ASSISTANCE

Information and assistance in respect to environmental management is available from the Environmental Services work group:

phone (08) 8999 4550

email [Environment.DoI@nt.gov.au](mailto:Environment.DoI@nt.gov.au) .

## ENVIRONMENTAL MANAGEMENT SPECIFIC REQUIREMENTS- hold Point

In addition to the Standard Specification for Environmental Management, the following project specific requirements shall apply to the works.

The Contractor’s Environmental Management Plan must include or be supplemented by:

* A project specific Erosion and Sediment Control Plan, conforming to the International Erosion Control Association (IECA) Australia Best Practice Erosion and Sediment Control guidelines (http:/www.austieca.com.au).
* Mosquito and biting insect management measures to prevent the creation of habitats for biting insects during construction.
* Weed Management Plan
* Cycad removal and permanent relocation plan

Retention of existing vegetation within Sections 4294, 4295 and 5936 is to be maximised to ensure the amenity of the existing bushland is retained. Therefore, clearing of vegetation within the works sites is to be minimised and not to extend beyond the limit of access as defined on the project drawings.

**Hold Point** – Prior to the commencement of clearing, the Contractor is required to submit a dimensioned plan to the Superintendent identifying the proposed clearing limits and areas to be cleared, provided in PDF and CAD file format to datum GDA94 MGA Zone 52. The actual clearing limits are to be approved by the Superintendent following a site walkover prior to the commencement of clearing activities.

The Superintendent shall confirm if the plan is acceptable for use by the Contactor in order to mark out the proposed clearing limits in advance of the site walkover with the Superintendent. If the clearing plan is not acceptable the Superintendent will indicate the changes the Contractor is required to make to the plan. The Contractor shall make such changes to the plan and resubmit it to the Superintendent for review.

Once the Contractor has marked out the clearing limits on site according to the approved plan the Superintendent and Contractor shall undertake a joint walkover to inspect the clearing limits. During the site walkover the Superintendent will advise if any further changes are required to the clearing limits. If no changes are required the Superintendent will release the Hold Point

If changes to the clearing limits are required the Contractor will make such changes to the limits on site during the site walkover and will provide an updated plan to the Superintendent immediately upon the completion of the site walkover upon which allow the Superintendent to release the Hold Point.

### Environmental Management Plan (Mandatory)

Complete the Environmental Management Plan (EMP) Proposal in the RFT Response Schedules and submit as part of the tender documentation.

Address all of the questions outlined in the EMP Proposal and include sufficient detail to allow assessment of the intent of the proposed EMP document.

Submit the completed EMP for the project within 7 days of the awarding of the Contract and before any work is commenced on site.

A Notice of Intent (NOI) has been developed and assessed by the NT EPA as not requiring further assessment under the *Environmental Assessment Act*. The NT EPA did, however, identify potential risks to the environment that need to be addressed. These include:

* Individual plants of the threatened species *Cycas armstrongii* should be salvaged and reused in accordance with the *Management Program for Cycad in the Northern Territory of Australia, 2009-2014* (Liddle, 2009). The contractor must allow for this in their Environmental Management Plan.
* Weeds (including Mission Grass and Gamba Grass) have been identified on the site. Ensure that the EMP includes weed management as per the *Weed Management Act*.

### Erosion and Sediment Control Plan

A site specific Erosion and Sediment Control Plan (ESCP) is required to be developed, approved and implemented on site.

The ESCP is to be produced as per the standard specifications in environmental management and controls implemented on site as per the ESCP. Any alterations to the ESCP are to be discussed with the Superintendent and are be updated on the plan.

### Sacred Sites Protection Conditions

An Aboriginal Areas Protection Authority (AAPA) Certificate allows for the project works.

### Approval to Draw Water

Apply to the relevant authority (generally Power and Water Corporation) for approval to draw water from a reticulated supply.

Permits from Power Water are generally available immediately.

The preferred option for the supply of water is through a dedicated work supply point located throughout major urban centres and the Darwin rural area. These supply points are accessed through a Power and Water swipe-card.

Where such supply points are not available, Power and Water may issue a portable meter, which requires a deposit, to extract water from nominated supply points.

Provide evidence to the Superintendent of the approval to draw water from the appropriate authority and pay all costs and charges.

### Approvals for Borrow Pits

The Principal has neither sought nor obtained the requisite clearances and approvals for Borrow Pits for this project.

Construction Materials are to be sourced from commercial suppliers.

### Cycad Removal- Hold Point

**Hold Point** - Prior to any clearing works, Contractor shall survey the number of individual cycads within the areas to be cleared and arrange for removal and permanent relocation using legal methods. .

## ENVIRONMENTAL MANAGEMENT SCHEDULE 1 - hold POINTS

|  |  |  |
| --- | --- | --- |
| **CLAUSE TITLE** | **SECTION** | **PAGE No** |
| Approval of Contractor’s Environmental Management Plan  (Template available through Environmental Management links at <https://infrastructure.nt.gov.au/specification-services/technical-specifications/environmental-management>, in Supplementary Documents folder.) | 24.2 | 15 |
| Approval of Contractor’s ESCP | 9.5 | 43 |
| Cycad Removal | 9.5.6 | 42 |

# Miscellaneous Provisions

## 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 Set

AS 2187.1 Explosives - Storage, transport and use - Storage

AS 2187.2 Explosives - Storage, transport and use - Use of explosives

NTMTM NT Materials Testing Manual

NTCP NT Codes of Practice)

NTTM NT Test Methods

Aboriginal Land Rights (NT) Act

Mining Titles Act and Mining Management Act

Workplace Health and Safety (National Uniform Legislation) Act and Regulations

Dangerous Goods Act and Regulations

Railways of Australia (ROA) Code - Installation of Other Parties Services and Pipelines Within Railway Boundaries

The Water Act

The Energy Pipelines Act (NT Gas)

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

Standard Specification for Environmental Management, DoI publication

### Standards in Conflict

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

### Overseas Standards

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

## 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.

EXTRACTION AREA: An excavation outside the formation limits for obtaining fill, gravel, rock and rubble. Also known as Borrow Pit.

DRY DENSITY RATIO: The percentage ratio of the field dry density of a material to the modified maximum dry density (MMDD) of that material. This property is also termed Relative Compaction.

WITNESS POINT: Give the Superintendent sufficient prior notice, in writing, of an action so that that part of the works may be inspected.

HOLD POINT: Obtain the Superintendent’s written approval for that particular part of the works.

## The Conditions of Tender and Conditions of Contract

The Conditions of Tender and the Conditions of Contract contain additional requirements which apply to works carried out under any contract awarded by NT Government, including any works carried out using this specification.

## Environmental Management

The Standard Specification for Environmental Management applies for all construction and demolition work for building and civil works carried out by or on behalf of the Northern Territory Government. The Standard Specification for Environmental Management takes precedence over this specification. A copy of that document is available via: <https://infrastructure.nt.gov.au/specification-services> .

## Establishment

### 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.

### Compound/Workshop – Hold point

**Hold Point -** 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.

## Explosives

Use of explosives is not permitted.

## Plant and Equipment

### Specification Reference

### Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

### General

Do not clean spray bars or other contaminated equipment on the work site.

Clean plant and equipment in a location and in a manner which prevents pollution of the surrounding environment.

Clean plant and equipment before it is brought on to the site and immediately before it leaves the site to make it pest and weed free.

Plant and equipment is to be inspected and maintained as necessary during the course of the works. Emissions and fluid leaks are to be minimized by ensuring plant and equipment are well maintained, in good repair and in good working order.

### Mobile Plant Machinery - Broadband Alarm

**Standards**

AS 4742:  Machine-mounted forward and reverse audible warning alarm (withdrawn)

ISO 9533: [Earth-moving machinery - Machine-mounted audible travel alarms and forward horns - Test methods and performance criteria](http://www.saiglobal.com/online/Script/Details.asp?DocN=ISOA00001_2610)

**Definitions**

**Broadband alarm:** Pulsed acoustic signal that comprises a range of frequencies and sometimes referred to as quacker, woosher, non-tonal reversing beepers or white sound.

### Broadband/White-Sound Alarm Requirement:

Broadband Alarms (White Sound) must be fitted to all construction vehicles and mobile plant before commencement of works.

Ensure that installation and operations of the alarm/warning systems are sufficient before commencement of works, including, but not limited to:

All alarms clearly audible above the noise level of the machinery or vehicles.

Alarms are automatically activated when reverse gear is selected in the vehicle to which it is fitted, or when the machine to which the alarm is fitted is switched on and is in use.

Directional nature of the broadband alarm is appropriate for works.

## Safety

Comply with the Work Health and Safety (National Uniform Legislation) Act and Regulations and any applicable Codes of Practice.

### Safety Officer – Witness Point

**Witness Point -** 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.

### 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.

### Safety Helmets

Adhere to the requirements of the Construction Safety Act.

## 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.

## Project Notice Boards

Supply, erect and maintain Project Notice Boards, at locations nominated by the Superintendent and in accordance with the ROAD FURNITURE AND TRAFFIC CONTROL DEVICES Section, within 2 weeks of establishment on site.

Design the Project Notice Boards in accordance with drawing number(s) CS0451

Include the following project specific wording on the boards;

Northern Territory GOVERNMENT (Logo)

Rapid Creek Flood Mitigation Project

$9.0 million

Completion: December of 2017

Remove the boards within 2 weeks after the Certificate of Practical Completion has been issued.

## Level Checking

Check levels of finished surface top of of water retaining embankment at 25 m intervals.

Check levels of bed of completed drain 1 at 25 m intervals.

Check levels of excavated basin floor using 25 m grid.

Check levels of inverts of culverts.

Check levels using an independent and competent surveyor who is eligible for membership of the Institution of Surveyors Australia or the Institution of Engineering and Mining Surveyors Australia.

## Level Auditing

The Superintendent may choose to audit any level survey submitted to show conformance with the specified tolerances.

Provide an experienced survey assistant when requested by the Superintendent to assist in audit checking.

## Control Station Check Survey – witness point

Refer to the Preliminary Clause SURVEYS AND SETTING OUT.

**Witness Point -** Where results exceed the quoted tolerance notify the Superintendent and obtain directions.

## Cycle and Pedestrian shared Paths

Refer to Design drawings (if any) and conform to local Department of Infrastructure Planning and Logistics requirements.

## As Constructed Information - WITNESS POINT

Document all changes to and variations of the design as the work proceeds.

Provide amended versions of the information and drawings which reflect the as built conditions.

Provide PDF copies of drawings and provide the drawings in CAD format i.e. AutoCad or Microstation, in accordance with NTG Technical records drawing archiving requirements..

Provide electronic copies of text information in A4 portrait format in PDF and in Microsoft Word document electronic format.

Provide the amended information and drawings to the Superintendent progressively as the work proceeds, with or before the claim for the variation which led to the need to amend the information and drawings to accurately reflect the as built condition.

**Witness Point -** Before the work commences provide a proposed procedure for recording and submitting the amended drawings.

Use an independent surveyor who is eligible for membership of the Institution of Surveyors Australia or the Institution of Engineering and Mining Surveyors Australia to record the changes and variations.

Provide as-constructed survey for completed earthworks, drainage works and protection works surfaces within the detention basin. Combine this survey into a single CAD file with survey of the areas marked on the Drawings.

## site access requirements

### Proposed Access, Egress and Construction Traffic Routes

Refer to drawings R17-1402, R17-1403 and R17-1404 which outline the proposed site accesses, egresses and traffic routes. These have been agreed in-principle with the road authorities and are to inform the basis of construction traffic movements.  Contractor is to develop traffic management plans and obtain all necessary permits and approval prior to commencement of works, refer also ‘PROVISION FOR TRAFFIC’ section.

### Large Vehicle Restrictions

The nominated traffic routes are limited to vehicles no larger than 19m.

Construction vehicles shall be limited to not be in excess of 19m in length.

### Restricted Working Hours

Due to the volume of public traffic on the adjoining roads, vehicle movements directly related to earthworks supply and/or disposal to and from site shall not be used on public roads during peak traffic times: 7:30 to 8:30am and 4:30 to 5:30pm. Refer also Provision for Traffic section.

While works can continue, no heavy vehicle traffic is to exit out of Section 3091 onto Abala Rd during Saturdays 7:00am to 7:00pm or Sundays 9:00am to 5:00pm for the entire project duration.

### Protection of Services Crossing Construction Access

All services crossed by site accesses or egresses are to be located, depth determined and adequately protected from damage for the duration of the project.

### Side Tracks and Detours

Contractor shall for the duration of the works maintain two way traffic and pedestrian flow on Henry Wrigley Drive at all times for all vehicles and users of the shared path. See also Provision For Traffic Section.

### Asset Condition Report

Prior to commencement of works the contractor shall arrange joint inspection with the appropriate road authority and Superintendent and prepare an asset condition (dilapidation) report documenting the current condition of the roads and all other public assets that may be impacted by the works including site entry and egress areas. This includes but is not limited to the following assets: roads, kerbs, storm water structures, paths, traffic barriers, bollards, fences, sewer access chambers, sewer pipes, communication pits. Abala Road is to be documented for the full extent of the construction exit route. McMillans Rd is to be documented at the proposed entry site including the existing bus bay and at the site of the proposed temporary bus bay.

### Permits and Approvals

Prior to commencement of the works Contractor is to obtain all permits and approvals for works within Road Reserves, Occupational License for works within Crown Land and permits from City of Darwin (COD) for works within Council Land.

### Coordination with Concurrent Works

Contractor shall liaise with and coordinate with concurrent construction projects within adjacent properties (below), ensuring access to project sites is unimpeded.

* Tennis NT – Section 6294, 23 Abala Road, Marrara and;
* Netball Association – Section 5936, 235 Abala Road, Marrara

### Sporting and Other Events

The Contractor shall at all times ensure that their construction activities do not restrict public access to the Darwin International Airport, Marrara Sporting Complex, Darwin Netball Association and all other local Businesses or clubs.

### Prioritisation of Traffic

Traffic exiting out of Section 3901 must give way to all public vehicles and pedestrian traffic.

### Site Access and Egresses

All public roads used for and adjacent to construction access or egress shall be kept clean and free from dust and debris.

All site egresses shall be suitable for all construction traffic and be bitumen sealed, at a minimum 10m preceding a heavy duty rumble strip and for a further 40m before entering a public road.

Contractor is to allow for cleaning of sealed egresses as required to ensure public roads are kept in a clean and safe condition.

In addition to the sealed egress and rumble strip, an all-weather gravel construction track is to be provided along the length of Sec 3091 and is to be maintained for the duration of the contract.

At completion of the works, Contractor shall reinstate all access and egress tracks to original condition to the Superintendents satisfaction.

### Limit of Works

No works are permitted beyond the limit of works as described in the project drawings without the written approval from the Superintendent.

Prior to commencement of works and in addition to normal set out requirements the indicated limit of works is to be surveyed and pegged.

The area south west of the proposed basin works is an area of high interest for various groups. The area is to be zoned conservation. Works cannot extend into Section 4295 beyond that designated by the limit of access.

Prior to commencement of works a temporary ‘Barrier Fence’ comprising; star pickets and strainer posts as required, 3 strands of tensioned galvanised fencing wire (top, middle and bottom), and minimum 1m high UV stabilised shade cloth (orange in colour) is to be erected in the locations as shown on the Construction Access Requirements drawings. The fence alignment must not extend beyond the limit of access as indicated, but may vary within the limit of access to avoid damage to trees, shrubs or cycads as approved by the Superintendent.

### Reinstatement of Disturbed Areas

Upon completion of the works, Contractor shall reinstate all disturbed areas outside of the permanent works footprint to original condition, as specified and to the satisfaction of the Superintendent.

# PROVISION FOR TRAFFIC

## GENERAL

Minimise obstruction and inconvenience to the public.

Ensure public safety is accommodated at all work sites.

A traffic escort vehicle is required for all resealing works.

Assume responsibility for the safe conduct of traffic through, past or around the works, 24 hours a day, from possession of the site to completion of all works, defects liability period (if any) and handover.

Comply with the Acts, Regulations, Codes and Guidelines applicable to the works. Comply with the requirements of Authorities which have jurisdiction over the works or the sites of the works.

Comply with the Work Health and Safety (NUL) Act and Regulations.

## STANDARDS

Conform to the following Standards and Publications unless specified otherwise:

AS 1742.3 Manual of uniform traffic control devices - Traffic control devices for works on roads.

AS 1742.9 Manual of uniform traffic control devices – Bicycle facilities

AS 1742.10 Manual of uniform traffic control devices – Pedestrian control and protection

AS/NZS 1906.1 Retroreflective materials

AS/NZS 3845.1 Road safety barrier systems

AS 4191 Portable traffic signals

AS/NZS ISO 31000 Risk management

NTTM NT Test Methods.

NTMTM NT Materials Testing Manual.

AUSTROADS Guide to Road Design

AUSTROADS Guide to Bridge Technology

NT WorkSafe All Relevant Bulletins

## DEFINITIONS

Long term: applies when traffic guidance is required to operate for more than one shift irrespective of whether it is day or night,

Short term: applies when work is started and completed in one shift and the road is returned to normal conditions by the end of that shift.

Traffic Controller: person responsible for the control of traffic on public roads utilising a stop-slow bat.

## workzone traffic management

### Traffic Management Personnel

All personnel engaged in the works must have a current valid NT Construction Induction White Card, or equivalent qualification recognised by WorkSafe NT.

Only persons qualified in nationally accredited units of competency in Workzone Traffic Management can be utilised for traffic management at worksites. The four levels of accreditation are:

1. Workzone Traffic Supervisor (WZ3)
2. Workzone Traffic Controller (WZ2)
3. Workzone Traffic Management Plan Designer (WZ1)
4. Escort mobile road marking operations (WZ 4)

The Superintendent may grant approval for the use of a “Trainee Traffic Controller” within the work site. Such approval will only be considered after submission of a written request. A Trainee Traffic Controller cannot commence work until such approval has been granted and received in writing.

### Trainee Traffic Controller

A Trainee Traffic Controller must meet all of the following criteria:

1. be an employee of the Traffic Control Provider,
2. hold a valid current Australian motor vehicle driver’s licence,
3. be registered with a Northern Territory Registered Training Organisation (NT RTO) to undertake the RII09 Resources and Infrastructure Industry Training Package unit of competency “RIIWHS205D Control Traffic with a STOP/SLOW Bat” (or the replacement unit of competency if and when applicable),
4. only work under the direct supervision of a Controller (WZ2) ,
5. have commenced training to become a qualified Controller (WZ2) and complete all assessments of competency within 8 weeks of registration.

The direct supervision of a Trainee Traffic Controller is defined as the constant personal oversight of the work by a Workzone Traffic Controller (WZ2).

### Workzone Traffic Supervisor (WZ3)

The following prerequisites must be met to enable NT accreditation as a Traffic Supervisor (WZ3):

1. hold a valid current Australian motor vehicle driver’s licence, and either
2. successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency “RIIWHS302D Implement Traffic Management Plan” (or the replacement unit of competency if and when applicable) training course through an Northern Territory Registered Training Organisation, or
3. successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency “RIIWHS302D Implement Traffic Management Plan” (or the replacement unit of competency if and when applicable) training course through a Registered Training Organisation from another State or Territory AND successfully completed a bridging course through a Northern Territory Registered Training Organisation in the above unit of competency.

### Workzone Traffic Controller (WZ2)

The following prerequisites must be met to enable NT accreditation as a Traffic Controller (WZ2):

1. hold a valid current Australian motor vehicle driver’s licence, and either
2. successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency “RIIWHS205D Control Traffic with a STOP/SLOW Bat” (or the replacement unit of competency if and when applicable) training course through an Northern Territory Registered Training Organisation, or
3. successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency “RIIWHS205D Control Traffic with a STOP/SLOW Bat” (or the replacement unit of competency if and when applicable) training course through a Registered Training Organisation from another State or Territory AND successfully completed a bridging course through a Northern Territory Registered Training Organisation in the above unit of competency.

### Workzone Traffic Management Plan Designer (WZ1)

The following prerequisites must be met to enable NT accreditation as a Traffic Management Plan Designer (WZ1):

1. hold a valid current Australian motor vehicle driver’s licence, and either
2. successful completion of RII09 Resources and Infrastructure Industry Training Package unit of competency “RIICWD503D Prepare Workzone Traffic Management Plans” (or the replacement unit of competency if and when applicable) training course through an Northern Territory Registered Training Organisation, or
3. successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency “RIICWD503D Prepare Workzone Traffic Management Plans” (or the replacement unit of competency if and when applicable) training course through a Registered Training Organisation from another State or Territory AND successfully completed a bridging course through a Northern Territory Registered Training Organisation in the above unit of competency.

### Escort Mobile Road Marking Operations (WZ 4)

The following pre requisites must be met to enable Northern Territory accreditation as an Escort mobile road marking operations (WZ 4):

* hold a valid current Australian motor vehicle driver’s licence, and either
* successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency “RIICRM201D Escort mobile road marking operations” (or the replacement unit of competency if and when applicable) training course through a Northern Territory Registered Training Organisation, or
* successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency “RIICRM201D Escort mobile road marking operations” (or the replacement unit of competency if and when applicable) training course through a Registered Training Organisation from another State or Territory AND successfully completed a bridging course through a Northern Territory Registered Training Organisation in the above unit of competency.

### NT Accreditation in Workzone Traffic Management

NT accreditation is provided by the following process:

1. Completion of training course (or courses) as outlined above, and
2. Obtain Workzone Traffic Management ID Card from NT Motor Vehicle Registry.

### Traffic Escort Vehicle – Resealing Works

Provide a traffic escort vehicle for all work sites where resealing works are undertaken under the contract. The vehicle must have, as a minimum, one rotating beacon light. The escort vehicle is to be the lead vehicle for traffic permitted to pass through the work site at the direction of the traffic control personnel. The escort vehicle is to control the speed of the traffic to ensure safety of road works personnel. The driver of the escort vehicle is to have adequate skills and knowledge to be able to maintain safety of the public and of the roadworks personnel.

## TRAFFIC MANAGEMENT PLAN

### Submission of Traffic Control Diagrams

Standard: To AS 1742.3 Traffic control for works on roads.

Provide a Traffic Management Plan and Generic Traffic Control Diagrams of a complex and noncomplex nature per activity as required for the scheduled works.

### Traffic Management Plan – Hold Point

**Hold Point –** Submit the Traffic Management Plan, with the Traffic Control Diagrams, prior to commencing the works.

The Traffic Management Plan (TMP) is required to be designed by a Northern Territory accredited Traffic Management Plan Designer. Include the details of the TMP Designer’s name, accreditation number and date of expiry of accreditation on the TMP.

Design the TMP in conformance with the requirements of AS 1742 – ‘Manual of uniform traffic control devices Part 3: Traffic control devices for works on roads’. Produce the plan by electronic means and submit electronically to the Superintendent.

Include sufficient details on the TMP to explain the potential hazards, the assessed risks and the proposed treatments for the proposed work activities and work site which may include some or all of the following:

### Project Information

Include sufficient details on the TMP to explain the potential hazards, the assessed risks and the proposed treatments for the proposed work activities and work site which may include some or all of the following:

1. Purpose and Scope
2. Project Location
3. Site Constraints/Impacts
4. Traffic Management Objectives and Strategies
5. Principal for the Works; Principal Contractor/Design Consultant including contact details
6. Responsibilities including role responsibility and authority of key personnel, management hierarchy including site representatives and contact details of the responsible personnel
7. Prior approvals (if any) granted by the Road Authority with relevant reference number

### Works on Roads

1. Project scope inclusive of works to be undertaken, staging of works, duration of works (work hours)
2. Existing Traffic and Speed environment
3. Roles and Responsibilities
4. Traffic Management Responsibility Hierarchy
5. Project Representatives
6. Traffic Management Administration

### Statutory Requirements

1. Work Health and Safety (NUL) Act and Regulations
2. Provide details on the TMP of responsibilities and authorities of all key personnel on the project including project manager, line managers (site engineers, supervisors etc.), contractors and workers, safety personnel and traffic management personnel
3. Requirements of personal protective equipment, plant and equipment
4. Procedures for incidents or accidents

### Monitoring and Measurement

1. Site Inspections and Record Keeping
2. TMP Auditing
3. Public Feedback
4. References

### Management Review

1. TMP Review and Improvement
2. Variations to Standards and Plans
3. Attention to hazards for non-motorised road users

### Planning

1. Risk Identification and Assessment – Critical element to identify and assess foreseeable potential hazards associated with the work activities and work site
2. Legal and Other Requirements – Confirmation of use of up-to-date information and legislation
3. Traffic Assessment (Vehicular Traffic)
4. Volume and Composition
5. Existing and Proposed Speed Zones
6. Intersection Capacity
7. Existing Parking Facilities
8. High Wide Loads
9. Public Transport
10. Special Events and Other Works
11. Non-motorised Road Users
12. Cyclists and Pedestrians
13. People with Disabilities
14. School Crossings
15. Site Assessment
16. Access to Adjoining Properties
17. Environmental Conditions
18. Impact on Adjoining Road Network
19. Works Programming
20. Work Sequence
21. Night Works
22. Emergency Planning
23. Consultation and Communication
24. Approvals – Road, Utility and Service Authorities
25. Public Notification
26. Notification to Other Agencies

### Implementation

1. Hazard Identification, Risk Assessment and Control
2. Traffic Control Diagrams
3. Traffic Control Devices
4. Signs
5. Pavement Markings
6. Variable Message Signs
7. Delineation
8. Temporary Speed Zones
9. Emergency Arrangements
10. Site Access
11. Communicating TMP Requirements

### Submission Of Traffic Control Diagrams

Provide specific or generic Traffic Control Diagrams (TCD) per activity as required and/or as specified.

Where a traffic management situation is not covered by a generic TCD, submit the specific TCD to the Superintendent 5 working days prior to undertaking the required works. Submitted Traffic Control Diagrams shall in turn then become generic.

## AUDITS OF WORK SITE TRAFFIC MANAGEMENT

Appropriately qualified and experienced Auditing Officers from DIPL Road Projects may perform random audits of traffic management at work sites as part of their daily routine duties. The Auditing Officer will hold current NT accreditation as a Traffic Management Plan Designer.

Audits undertaken will include verification of:

1. The Traffic Management Plan (TMP) held on site,
2. The Traffic Control Diagram(s) (TCD) held on site,
3. Traffic control devices established in accordance with the Traffic Control Diagram,
4. The correctness and currency of accreditation of all personnel associated with traffic management at the work site.

Where the Auditing Officer deems modifications to Traffic Management are required for reasons of public safety or safety on the work site, an Instruction to Contractor (ITC) will be issued requesting immediate correction. If modifications are deemed necessary but not urgent, corrections are to be made at the earliest practicable opportunity.

### Non Compliance

Where personnel associated with traffic management at work sites are found not to have current accreditation to an appropriate level in Workzone Traffic Management, the Superintendent may direct the Contractor to cease work, make the site safe, and withdraw plant, equipment and personnel from the road reserve.

## WORK IN built up AREAS – HOLD POINT

### Working Times

Program work, provide and install traffic management devices/controllers, equipment, materials etc. accordingly so that traffic flows are not impeded during peak hours for activity at Darwin International Airport.

The Contractor will also programme work requiring traffic control on Henry Wrigley Drive so as to minimise disruption to major events at the Marrara Sporting Complex.

**Hold Point** – Propose a programme of proposed working hours and obtain Superintendent approval.

Remove or cover signs or devices as appropriate to stop confusion during these hours. Further restrictions may apply should the DIPL deem it appropriate to do so. Concessions to work within these hours may be approved by the Superintendent, should the need arise and the officer deems it necessary.

Do not operate construction vehicles used in conjunction with the proposed works, either SV plated or vehicles in excess of 19 metres on public roads during peak traffic times (see above, working times) or in any way impede peak traffic flow during these times. Vehicles in excess of 19 metres in length are only permitted to travel on roads designated for road trains unless an appropriate permit from the Motor Vehicle Registry has been obtained in advance of using such routes.

### Traffic Lanes

Maintain at least 2 lanes (one in each direction) open to traffic at all times unless permitted otherwise on duplicated roads and maintain at least one lane open on two lane roads with appropriate traffic control in place accordingly. Obtain the written permission of the Superintendent if it is necessary to fully close a road.

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

Obtain prior written approval from the relevant Local Government or Council if traffic is to be detoured onto their road network or the proposed works affects their network/assets accordingly.

Provide a copy of all relevant approvals with the Traffic Management Plan.

## 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 with or restrict sight lines, particularly at intersections and ensure that the devices are not obscured by trees or other objects.

Ensure that road work signs reflect the current conditions of the site. Remove or cover signs such as T1-5 (worker symbolic), temporary speed reductions and the like, when not appropriate, such as when no persons are on site. Refer to AS 1742 for guidance on the appropriate use of these signs.

### Works in Progress Signs

For proposed works which are expected to be in progress for greater than 14 days, display signs, sized 1200 x 900mm with 100mm high black Helvetica medium lettering on a white background displaying the following details:

* The nature of the works.
* The start and end date of the works.
* The Contractor’s business name.
* The Contractor’s business phone number.
* The Contractor’s after hours phone number.
* The name of the Traffic Management Plan supervisor.

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

### Multi Panel Signs

The use of multi panel sign configuration for “Traffic Controller Symbolic” & “Prepare to Stop” being mounted on one multi sign frame shall conform to AS 1742.3.

The use of the “Prepare to Stop” sign is mandatory in conjunction with the symbolic traffic controller sign where traffic are required to stop at the controllers position, therefore DIPL approves making this the exception to the “No multi sign rule”.

These signs must be on the one frame either side by side or one above the other. The individual signs are to be 900 mm x 600 mm minimum each when used stand alone, but may be reduced in size on a multi panel sign frame provided that the legend and / or symbol size are not reduced.

DIPL will allow a multi panel sign frame for this use only in accordance with the directions herein and those contained within AS 1742.3.

Mount signs on Oz Spike posts or similar, or set in concrete in accordance with the requirement for permanent speed sign installation

## NT SPECIFIC DIRECTIONS FOR ROAD WORK SIGNS

### Sign erection

Refer to the DEFINITIONS clause.

| **Table 11.1 - Sign erection requirements** | |
| --- | --- |
| **Long term rural areas:** | Place all signs a minimum 1m lateral clearance from the travelled path and a minimum of 1.5m from the lower edge of the sign to the ground. |
| **Long term urban areas:** | Place all signs a minimum of 2.2m from the lower edge of the sign to the ground in locations where they could be obscured by parked vehicles, vegetation or trees or may interfere with pedestrian routes. On traffic islands or medians the heights for signs shall conform to the “short term all areas” where it is deemed appropriate and only if they are not obscured by parked vehicles and if they do not interfere with pedestrian routes. |
| **Short term all areas:** | Display all signs prominently and place a minimum of 200mm from the lower edge of the sign to the ground, except regulatory signs such as speed, no parking signs etc, which shall be mounted a minimum of 1.5m from the lower edge of the sign to the ground. Place all signs a minimum of 2.2m from the lower edge of the sign to the ground where they could be obscured by parked vehicles, vegetation or trees or may interfere with pedestrian routes. |

Mount signs on Oz Spike posts or similar, or set in concrete in accordance with the requirement for permanent speed sign installations.

Ensure that signs are clean, free of damage and comprise of a minimum of Class 1 retroreflective material in accordance with AS/NZS1906.1.

Duplicate all temporary work signs (place on both sides of roads within the work site) on all multilane work sites, irrespective of the duration of the works, unless there is insufficient room available to do so, such as the median width being not sufficient to accommodate the signs. Where necessary, seek direction from the Superintendent where this condition cannot be complied width.

### Advance warning signs

In urban areas T1-1 (road work ahead) signs and T2-16/17 (end road work) signs at short term work sites are not mandatory, however, they may be used if deemed appropriate. Use these signs at all long term or rural work sites.

Only use T1-25 (road work on side road) signs on major or arterial roads or highways where works are being conducted on a lower hierarchy road i.e. roads with lower volume or speeds that intersect with such a major or arterial road or highway. Do not use these signs on lower hierarchy roads that intersect with a major or arterial road or highway.

### Star pickets & fence droppers

Do not use star pickets for support of road work signs, bunting, flagging, fencing, etc. within 9 metres of the trafficked path. Issues of sign, bunting, flagging, fencing, etc. stability can be addressed by prudent use of properly manufactured sign legs, sand bags, Oz spike posts and or fence droppers.

Do not use star pickets or any other non-frangible items such as steel drums, for delineation or any other purposes within 9 metres of the edge of the trafficked lanes. Bollards, cones and flagging are appropriate alternatives.

Fence droppers may be used as sign supports or legs and bunting or flagging supports on the condition that that the droppers are securely embedded into the ground and the sign, bunting or flagging is sufficiently secured to the droppers. Maintain a prudent use of end caps to ensure the minimisation of any hazards to workers and the public and the specified sign heights can be achieved.

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 and they are not within 9 metres of the travelled path of motorists.

### Non-standard signs – Hold Point

**Hold Point** - Obtain specific approval from the Superintendent before using signs not included in AS 1742.3.

### Variable message signs (VMS)

Where major disruptions or changes to the traffic part are likely to occur, provide electronic variable message signs in the following situations a minimum of 14 days before any changes occur, where changed conditions and or delays are to be experienced by the general public, particularly peak hour traffic;

* At all approaches to intersections
* At approaches to detours and / or
* At approaches to major works alterations

Assume full responsibility for the safe location of the variable message signs.

Use electronic variable message signs capable of displaying a minimum text size as specified in AS1742.3 and containing at least 3 lines with a minimum of 8 characters per line.

The Superintendent may provide details of the messages to be displayed and the locations of the variable message signs.

Do not, under any circumstances, use variable message signs for private advertising, within the NT Government road reserve or visible from the NT Government road reserve without the written approval of the Superintendent.

### Multi message signs

Do not use multi message signs. Stand-alone signs must be used.

### Work Zone Speed Limits – Mandatory

Where work zone speed limits are being proposed to be changed, the proposed temporary speed limits must be approved by the Superintendent prior to implementation of the proposed speed limits.

Erect speed limit signs in accordance with clause SIGN ERECTION.

All Traffic Management Practitioners must record in their Daily Diaries time, date, location photographs of each approach, of speed limit installations and removals for legal purpose. These logs are required to be sent to the DIPL Permit Officer at the completion of each project or monthly for long term projects greater than 1 month, via the Roads Reception 8999 4699, or faxed to 8999 4682.

### Temporary Speed Limits – Hold Point

**Hold point** - Submit temporary speed limit authorisation applications to alter speed limits to the Superintendent, 2 working days prior to the implementation of temporary speed limits, for approval under the Control of Roads Act.

Place repeater speed limit signs along the road, which has a temporary speed limit imposed, after all intersections with other roads within the speed limited area.

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

| **Table 11.2 - Target lowest speed limits** | |
| --- | --- |
| 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 the relevant Test Level in accordance with AS/NZS 3845 shall also be used. | 40 km/h |
| All other rural works. | 60 km/h |

### Road Safety Barriers

Design, install and maintain all road safety barriers used within the NT Government’s road reserve in accordance with AS 1742.3, AS/NZS 3845 and any other relevant and current Australian Standard associated with the works being proposed.

Failure to meet the requirements of the relevant and current standards may result in the project being suspended by DIPL or other relevant authorities, such as NT WorkSafe, without cost to that authority until the project meets the required safety standards.

## Excavations, Stockpiles and gradients within work zones and clear zones

### Safety Guidelines in Relation to Excavations;

Provide shoring to all trenching or excavations which are deeper than 1.5 metres and where a person is required to enter unless an engineer certifies that shoring is not required. Provide a copy of the Engineer’s certification on request.

Comply with the Work Health and Safety (NUL) Act and Regulations. Comply with the Safe Work Australia Excavation Work Code of Practice. Comply with other applicable Codes of Practice from Safe Work Australia and NT WorkSafe.

### DIPL requirements for excavations, stockpiles or other gradients

Comply with the following DIPL requirements for excavations, stockpiles or other gradients greater than 150mm, in addition to Appendix D of AS 1742.3:2009 Protection And Delineation At Excavation Works.

Implement the minimum protection requirements in accordance with AS 1742.3 during each work day, however, if any excavations, stockpiles or other steps in gradient greater than 150mm are to be left in place longer than one work shift or are left unattended for any period of time, during any day, overnight or weekend and adequate clearance in accordance with AS 1742.3 is not available, protect them by prudent use of approved road safety barriers, backfilling, covering and or removing from site accordingly.

## temporary pavement marking

Where new pavement surfacing or existing pavement resurfacing is being undertaken, install temporary raised reflective pavement markers at the end of each day and prior to the loss of daylight at 24 metres maximum spacing.

If so instructed by the Superintendent, temporary line marking at the end of each day may also be required until completion of the works when the permanent line marking is reinstated.

Only use temporary raised reflective pavement markers that comply with AS 1742.3:2009, Section 3.9 Devices For Delineating And Indicating The Travelled Path.

For long term road construction works where sealed detours merge into existing sealed pavements or where sealed side roads merge into sealed detours, line mark transition areas in accordance with the standard drawing for LINE MARKING, CS 1520 and in accordance with AS 1742 including the setting out of arrows, letters, numerals and chevrons.

### Removal of Temporary Linemarking

All line removal works must be carried out in such a manner as to not endanger the health, safety or amenity of employees, road users or the general public.

Carry out removal of marking is such a manner as to minimise damage to pavement surfaces.

Obliterate markings so as they are no longer recognisable as marking. When arrows, letters or figures are to be removed, the removal pattern must be in the shape of a rectangle or square to minimise confusion to the motorist, particularly in wet weather and poor lighting conditions.

The removed marking and the material used to remove the marking must be contained, collected and disposed of in an environmentally acceptable manner.

## TRAFFIC CONTROL – Witness point

Modify the Traffic Management Plan during the works to suit site conditions if required or requested by the nominated DoI Contact Officer.

**Witness Point** - The Superintendent must appraise all changes to the TMPs and TCDs prior to implementation of any changes, unless there is an urgent need for amendments to mitigate hazards. In situations where immediate hazard mitigation is necessary the changes may be implemented and the Superintendent advised of the changes as soon as practicable thereafter.

If an incident occurs within, adjacent to, on approach to or departure from the work site, make a photographic record of the traffic control devices, site conditions, placement of plant and equipment etc, as soon as practical after the event. Advise the Superintendent of the incident as soon as possible.

Only permit single lane operation of two way traffic when traffic is directed by accredited WZTM controllers and signs or portable traffic signals etc. are employed, dependant on the site conditions and obtaining the appropriate approvals.

Organise Police control as required, or as requested by the Northern Territory Police should the need arise.

## SIDE TRACKS FOR DETOURS

### Construction

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

All side tracks shall be bitumen sealed and be maintained for the duration that the detour is in place.

Design and construct side tracks to comply with AUSTROADS "Guide to the Geometric Design of Rural Roads" and the following minimum standards:

| **Table 11.3 – Minimum Standards for Side Tracks - Part 1** | | | |
| --- | --- | --- | --- |
|  | **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 |

|  |  |
| --- | --- |
| **Table 11.4 – Side Track Minimum Requirements - Part 2** | |
| **Item** | **Requirement** |
| 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: | 500 m max. |
| Side track type: | Local road (sealed) |

Compact top 150 mm to 95% MMDD.

Match side tracks neatly to the existing road system.

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

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

Provide and maintain adequate drainage.

Sealed side tracks to be primer sealed with 7 mm aggregate as specified in the SPRAY SEALING Section.

### Maintenance

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

|  |  |
| --- | --- |
| **Table 11.5 – Side track maintenance requirements** | |
| **Surface type** | **Maintenance required** |
| Sealed Surfaces: | Patch and repair all surfaces. Grade and roll shoulders. |
| 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.

## 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 proposed and approved signs detailing alternative access, only after approval from the Superintendent is obtained.

Ensure adequate access is maintained for pedestrians and cyclists as required, including delineated access if existing paths are being closed as part of the works.

## temporary pedestrian access

Conform to: AS 1742.9, AS 1742.10.

Maintain access for pedestrians, cyclists and persons with disabilities passing through and around the work site. Where existing paths have been demolished or are inaccessible or modified due to construction works, provide temporary access to a standard not less than the pre-existing or preconstruction standard.

Temporary access must;

* be clearly delineated and have adequate width and height clearance,
* be smooth, free draining and free of obstructions and loose material,
* provide clear guidance where paths change direction,
* be illuminated by temporary lighting in urban areas to assist path users where existing street lighting has been removed or affected by the works,
* be arranged so that path users are clearly visible to vehicle drivers and plant operators at road crossing points.

## TEMPORARY BRIDGING – hold point

Design and construct any temporary bridging in accordance with the AUSTROADS Guide to Bridge Technology.

**Hold Point -** Obtain written approval from the Superintendent Manager, Road Projects prior to commencement of any such works.

Ensure all environmental approvals have been obtained prior to the commencement of the works.

**Hold Point** - Provide copies of approvals obtained by Contractor to the Superintendent prior to the commencement of the works.

Provide and erect signage, fencing, road safety barriers and or guard railing etc. to prevent accidental access to the feature being bridged.

## CONTRACTOR'S PLANT AND EQUIPMENT – HOLD POINT

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

Keep parking and materials storage clear of trafficked areas and clear zones in accordance with applicable AUSTROADS guides.

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

**Hold Point** - On roads carrying significant traffic, floodlight the road and area within 50 m of the site when working at night, if approved by the Superintendent, to a ground level luminance of 10 lux minimum.

### Mobile Plant - Broadband Alarm

Standards

AS 4742:  Machine-mounted forward and reverse audible warning alarm (withdrawn)

ISO 9533: [Earth-moving machinery - Machine-mounted audible travel alarms and forward horns - Test methods and performance criteria](http://www.saiglobal.com/online/Script/Details.asp?DocN=ISOA00001_2610)

Definitions

Broadband alarm: Pulsed acoustic signal that comprises a range of frequencies and sometimes referred to as quacker, woosher, non-tonal reversing beepers or white sound.

Broadband/White-Sound Alarm Requirement:

Provide all construction vehicles and mobile plant fitted with Broadband Alarms (White Sound) before commencement of works.

Ensure that installation and proper operations of the alarm/warning system is sufficient before commencement of works including but not limited to:

* All alarms clearly audible above the noise level of the machinery or vehicle.
* Automatically activated when reverse gear is selected.
* Directional nature of the broadband alarm is appropriate for works.

### Rotating Beacons on Plant

Provide beacons or other vehicle mounted warning devices on the highest point of the cabin roof or superstructure of all plant and equipment and in accordance with Clause 3.12 (Vehicle-Mounted Signs And Devices) of AS 1742.3 where these are being used within the road reserve. Fit beacons with a minimum of 75 watt globes. Do not use strobe lights.

Ensure that the light is operational whenever the plant or equipment is working on or within 9 metres the roadway.

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

Protect the lights from damage by scrub etc.

## Road work zone length

Comply with the requirements of AS 1742.3.

## Traffic Signal and count stations

### Traffic Signals

Prior to commencement of the works and for the duration of the works clear the work and co-ordinate with the DIPL Traffic Section for the appropriate region.

This includes all works within the trafficked lanes;

* 150 meters prior to the stop line
* 50 meters past the stop line
* that affects the normal daily traffic flow at the intersection or for road reserve or median excavations greater than 150mm
* within the area defined by the traffic signal poles and associated pits
* between the traffic signal poles and associated traffic signal control cabinet

### Traffic Count Stations

Count Stations have in-pavement detection systems installed and cutting off or closing traffic lanes can have an impact on their operation.

Prior to the commencement of work within the trafficked lanes and within 50 metres of traffic signals or within 20 metres of a count station controller, clear the work and co-ordinate for the duration of the works with the DoI Traffic Section for the appropriate region.

A map of count station locations is available from Department of Transport, Transport Infrastructure Planning, contact: (08) 8924 7531, or from the Annual Traffic count reports at: [www.transport.nt.gov.au/publications/traffic-reports](http://www.transport.nt.gov.au/publications/traffic-reports).

## PORTABLE TRAFFIC SIGNALS

Use portable traffic signals complying with the requirements of AS 1742.3 and AS 4191. Complete the portable traffic signal authorisation form (available from DIPL Traffic section) to seek formal approval from the Superintendent to use the proposed portable traffic signals and the proposed time settings.

Portable traffic signals are for short-term traffic control applications only. Where traffic signal control is being proposed for periods greater than 2 months in a single location, consider the installation of temporary traffic signals.

For the area under the control of portable traffic signals, limit the lengths to no more than 1150 metres. Use the time settings in the TIME SETTINGS clause as a guide for red time clearance and maximum green times. Frequently observe the prevailing traffic conditions and vehicle speeds and amend the times for the site as appropriate. Submit the changes to the Superintendent as soon as practicable thereafter.

### Temporary Speed Limits – Hold Point

Impose a controlled area speed limit not exceeding 80 km/h if the portable traffic signals would otherwise be in a higher speed limit zone.

**Hold Point** - Work zone speed limits require approval from to the Superintendent prior to implementation.

### Sight Distance

Maintain a sight distance on the approach to portable traffic signals of not less than 150 metres. If this cannot be achieved, use appropriate advance warning signage to advise road users in advance of the sight line obstruction of the impending traffic signals ahead.

In cases where queuing traffic is extending past the advance warning signage, install further advance warning signs and speed zone signs further in advance, to prevent collisions at the end of the que awaiting a green light. Avoid excessive traffic queuing by use of and adjustment of, appropriate time settings on the portable traffic signals whenever possible.

### Time Settings

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table – General Time Settings** | | | | |
| **Mode** | **All red** | **Minimum Green** | **Maximum Green** | **Amber** |
| Manual  Fixed time  Vehicle Actuated | M  S  S | F  F  F | M  S  S | S  S  S |
| F Fixed at 15 seconds  M Set the manual control switch each cycle  S Needs to be selected and pre-set by operator for each site | | | | |

|  |  |
| --- | --- |
| **Table – Amber Times** | |
| **Approach Speed** | **Amber Time** |
| Below 70 km/h  Above 70 km/h | 4 seconds  5 seconds |

| **Table - Red and Green Times** | | | |
| --- | --- | --- | --- |
| **All Red Period (Seconds)** | **Max Green Period (Seconds)** | **Distance Between Stop Lines at traffic Signals (m) – Clearance speed 20 km/h** | **Distance Between Stop Lines at traffic Signals (m) – Clearance speed 40 km/h** |
| 2 | 30 | 0-30 | 0-50 |
| 5 | 35 | 34-45 | 50-90 |
| 10 | 35 | 45-75 | 90-150 |
| 15 | 40 | 75-105 | 150-210 |
| 20 | 40 | 105-135 | 210-270 |
| 25 | 45 | 135-165 | 270-330 |
| 30 | 45 | 165-195 | 330-390 |
| 40 | 50 | 195-250 | 390-500 |
| 50 | 50 | 250-310 | 500-620 |
| 60 | 60 | 310-365 | 620-730 |
| 70 | 70 | 365-415 | 730-830 |
| 80 | 80 | 415-465 | 830-930 |
| 90 | 90 | 465-525 | 930-1050 |
| 100 | 100 | 525-575 | 1050-1150 |

## RESTORATION

Upon completion of works:

* Remove all temporary warning signage and other traffic control devices.
* Remove all temporary works and reinstate the areas to their original state, including the removal and disposal of seal and dragging windrows and debris back across the side track carriageway.
* Comply with the requirements of the Environmental Approvals and Clearances issued by DIPL, and DLRM, Environment Heritage and the Arts Division, Environmental Assessment and Policy Section, for the project.
* Stabilize all areas impacted by the works to prevent erosion.
* Where applicable reseed with local native grasses, trees and shrubs.
* Reinstate permanent traffic control devices temporarily removed during the works.

# Clearing, Grubbing And Rehabilitation

## General

SPECIFICATION REFERENCE; Refer to the Standard Specification for Environmental Management reference text.

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

## 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 and dispose of suing legal methods at a lega facility.

SALVAGED ITEMS; Nil

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

ACCESS; Access shall be limited to the Limit of Access extents as shown on the project drawings.

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 $15 per square metre.

## Trees To Be Retained

Retain selected trees shown on the drawings or as directed by the Superintendent.

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

## 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 shall be removed and disposed of off site .

GRASSES; Do not mulch grass clods, roots or other components containing viable propagules. This material shall be removed form site.

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

URBAN AREAS; Stockpile mulch on the site for reuse. The Contractor is to dispose of surplus mulch at an authorised disposal site.

## Stripping Of Top Layer

EXTENT; Strip all uncontrolled fill, organic matter and topsoil to a minimum depth of 100 mm, for the full width of the water retaining embankment, excavated area and associated batters, open drains, culverts and protection works.

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

Spread stripped material on areas to be landscaped following completion of earthworks.

## 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.

## Reinstatement

Reinstate any clearing outside of the permanent works footprint undertaken during the contract to rehabilitate the area back consistent with its untouched surrounds. This includes seeding, planting, watering and other measures necessary to rehabilitate the area in accordance with the LANDSCAPING section.

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.

## Cleaning Up

Remove all excess fill, rubble and other debris from the site. Dispose of the materials using a legal method.

# Earthworks

## Standards

Conform to the following Standard and Publication unless specified otherwise:

AS 1289 (set) Methods of testing soils for engineering purposes.

NTMTM NT Materials Testing Manual.

NTTM NT Test Methods

## Definitions

SUBGRADE SURFACE: The prepared surface immediately beneath the excavated basin floor, bed and banks of open drains or road pavement and shoulder layers.

Also extends under footpaths, kerb and gutter, and surface structures.

FOUNDATION SURFACE The prepared surface immediately under the water retaining embankment. Also extends under the toe filter and cut‑off key.

SUBGRADE: Top 150mm of material below subgrade surface or foundation surface.

UNPAVED AREAS: Those areas within the road reserve boundary which are not part of the road pavement, including any medians not paved, but excluding footpaths and vehicle access strips.

FORMATION WIDTH: Width of cut or fill out to the top or toe of any batters.

SURFACE FORMATION: The formation of an earth structure including the water retaining embankment, bund alongside drain 1 and open drains from material cut on site or imported.

CARRIAGEWAY: That portion of a road for the use of vehicles including shoulders and auxiliary lanes.

TOPSOIL A surficial soil containing some organic matter and usually darker than the underlying soils

## Earthworks In Cut

### Description

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

1. working cuttings, together with blending and moisture content adjustments so that material meeting the requirements of this Specification is used for the Embankment Fill where shown on the Drawings and Standard Fill elsewhere;
2. disposal of excess excavated material;
3. compaction of material below the subgrade surface; and
4. shaping and trimming of formation within cuttings.

### Excess Material – Hold Point

The Contractor has possession and is responsible for and shall make all arrangements for removing excess material from the Site and disposing of it an authorised location to be selected by the Contactor.

Comply with AAPA clearances.

Comply with Environmental Management approvals, including within the road reserve.

### Rock in Subgrade – Hold Point

**Hold point** - Obtain agreement from the Superintendent to the extent of the excavation.

Excavate rock encountered in the subgrade as directed by the Superintendent.

Avoid forming pockets of shattered material below the level of the excavation.

Remove all loose material.

Trim the excavation to shed water.

Outside of water retaining embankment: replace over‑excavated material with Standard Fill compacted to 95% MMDD.

Under water retaining embankment. replace over‑excavated material with Embankment Fill at OMC compacted to 98% MMDD.

### Unsuitable Material Below Subgrade Surface other than Rock – Hold Point

**Hold point** - 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.

Outside of water retaining embankment: Replace excavated material with Standard Fill compacted to 95% MMDD.

Under water retaining embankment. Replace excavated material with Embankment Fill at OMC compacted to 98% MMDD.

## 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.

### Filling of Crab Holes in Subgrade – Hold Point

**Hold Point** - Where cavities are found in the subgrade obtain directions from the Superintendent before works commence. Remove all loose spoil from cavities and then fill the cavities with lean mix concrete.

## Earthworks In Fill - EMBANKMENTS

### Description

Earthworks in fill includes winning, hauling, blending and working to specified moisture content, placing and compacting material on all prepared areas including holes, pits and other depressions.

There are three components to the embankment foundation as follows:

1. General embankment
2. Cut-off
3. Filter Material (Toe filter and filter diaphragm)

### EARTHWORKS IN FILL – GENERAL EMBANKMENT

#### Description

Earthworks in fill includes winning, hauling, blending and working to specified moisture content, placing and compacting material on all prepared areas including holes, pits and other depressions.

#### Preparation of General Embankment Foundation Prior to Filling

The foundation of the embankment shall be on competent material. Unsuitable materials such as low strength/density, compressible material, uncontrolled fill and/or topsoil shall be removed and replaced with suitable Embankment Fill material in accordance with the UNSUITABLE MATERIALS BENEATH GENERAL EMBANKMENT FILL section below in order to provide a foundation of adequate strength to support the embankment.

The following treatment for the general embankment foundation is required:

* Scarify the foundation material for a depth of 300mm to remove relic soil structure and potential drainage paths;
* Compaction of the foundation surface to 98% MMDD at optimum moisture content;
* Unsuitable materials beneath the general embankment foundation shall be treated in accordance with the UNSUITABLE MATERIALS BENEATH GENERAL EMBANKMENT FILL section below
* The foundation surface should be proof rolled to assist in locating weak and compressible soil;
* The surface should be cleaned of loose soil and rock prior to placing Embankment Fill; and
* The surface should be lightly scarified to a depth of 50 mm immediately prior to placement of the Embankment Fill material to assist in bonding of the layers and removal of preferential seepage paths.

#### Unsuitable Material Beneath General Embankment Fill – **Hold point**

**Hold Point** - Obtain directions from the Superintendent before works commence.

Remove unsuitable embankment foundation material, such as low strength/density, compressible material, uncontrolled fill and/or topsoil, which does not conform to the properties of Standard Fill as directed before the fill is placed.

Replace excavated material with Embankment Fill compacted to 98% MMDD at OMC.

#### Construction Method

Fill by the "Compacted Layer" method.

Compacted Layer Method

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

1. Deposit and spread the material in uniform level layers to a maximum thickness of 300 mm loose measurement for the full width of fill;
2. Moisture condition the Embankment Fill material between -1% to +3% of optimum moisture content;
3. Compact each layer to 98% MMDD before placing the next layer (refer Table - Dry Density Ratios for Conformance);
4. Before each additional lift is added to the embankment, the previous lift should be scarified to a depth of 50 mm to ensure that the two lifts are properly joined so that no natural seepage paths are present.

### EARTHWORKS IN FILL – CUT-OFF

#### Description

Earthworks in fill includes winning, hauling, blending and working to specified moisture content, placing and compacting material on all prepared areas including holes, pits and other depressions.

Excavate the cut-off key as shown on the Drawings.

#### Preparation of Cut-off Foundation Prior to Filling

The following treatment for the cut-off foundation is required:

* Found the Cut-off key in very dense clayey sand or moderately weathered rock as shown on the project drawings
* Remove highly permeable and erodible material which does not conform to the properties of Standard Fill, immediately below the foundation level to provide a low permeable, non-erodible foundation to the profiles shown on the drawings;
* The foundation surface should be proof rolled to assist in locating weak and compressible soil;
* Unsuitable materials beneath the Cut-off Foundation shall be treated in accordance with the UNSUITABLE MATERIALS BENEATH CUTOFF section below
* Foundation materials shall be free from lenses or pockets that differ substantially in composition, texture, moisture content or density from the surrounding materials; and
* The foundation material shall be smooth with no abrupt level changes or voids and be free of standing water.

#### Unsuitable Material Beneath Cut-off– **Hold point**

Obtain directions from the Superintendent before works commence.

Unsuitable materials such as low strength/density, compressible material shall be removed and replaced with suitable Embankment Fill material compacted to 98% MMDD at OMC in order to provide a foundation of adequate strength to support the embankment.

#### Construction Method

As for general embankment fill.

### EARTHWORKS IN FILL – FILTER MATERIAL

#### Description

Earthworks in fill includes importing, stockpiling and placing and compacting (where appropriate) material on prepared areas for the toe filter of the water retaining embankment and filter diaphragms around culverts that penetrate the embankment.

#### Preparation of Filter Material foundation

The following treatment for the filter material foundation is required:

* The toe filter shall be positioned on the natural stripped surface which is scarified but not compacted to a depth of 300mm.  The foundation surface should be proof rolled to assist in locating weak and compressible soil. Excessive proof rolling will destroy the soil structure and reduce the permeability, making it more difficult for seepage water to flow into the filter drain. Limit the number of passes by construction equipment to four unless approved otherwise by the Superintendent.
* Unsuitable materials beneath the general embankment foundation shall be treated in accordance with the UNSUITABLE MATERIALS BENEATH TOE FILTER section below
* Scarify the foundation material for a depth of 300mm prior to placing the filter material. and
* Immediately before placing the filter material, the surface should be cleaned of any loose soil and rock

#### Unsuitable Material Beneath Toe Filter – Hold point

Obtain directions from the Superintendent before works commence.

Unsuitable materials such as low strength/density, compressible material shall be removed and replaced with suitable Embankment Fill material compacted to 95% MMDD at OMC to provide a foundation of adequate strength to support the embankment. Prepare the replaced foundation in accordance with PREPARATION OF FILTER MATERIAL FOUNDATION.

#### Construction Methods

TOE FILTER

1. Deposit and spread the filter material as shown on the Drawings. The toe filter material does not require compaction.
2. Place geotextile over the toe filter as shown on the Drawings

FILTER DIAPHRAGM

1. Place geotextile so as to wrap over, under and around the filter diaphragm.
2. The filter diaphragm shall be compacted by a hand operated vibrating plate compactor to a dense state of compaction (min 65% relative density).

## Earthworks In Fill – culvert fill under embankment

### Description

Earthworks in fill includes winning, hauling, blending and working to specified moisture content, placing and compacting material on all prepared areas including holes, pits and other depressions other than for embankments.

### Preparation Prior to Filling

Over-excavate beneath the line of culverts as shown on the Drawings. Replace the excavated material with Embankment Fill at 95% MMDD at 1% to 2% wet of OMC. Place material in maximum 300 mm (loose) lifts.

### Construction Methods

Fill by the "Compacted Layer” method.

Compacted Layer Method

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

1. Deposit and spread the material in uniform level layers to a maximum thickness of 300 mm loose measurement for the full width of fill.
2. Compact each layer to 95% MMDD (refer Table - Dry Density Ratios for Conformance) before placing the next layer.
3. 1% to 2% wet of optimum moisture content.

### Placement of Filter Material around culvert – Witness Point

1. Place filter material (filter diaphragms) around the culvert as shown on the Drawings and as specified in Construction Methods Section 13.5.4.4

## Earthworks In Fill – OTHER FILLS

### Description

Earthworks in fill includes winning, hauling, placing and compacting material on all prepared areas including holes, pits and other depressions other than for the water retaining embankment.

### Preparation Prior to Filling

Subsequent to stripping of topsoil, Compact subgrade layer to 95% MMDD (refer Table - Dry Density Ratios for Conformance)

### Unsuitable Material Beneath Other Fill – Hold point

**Hold point** - Obtain directions from the Superintendent before works commence.

Remove unsuitable material which does not conform to the properties of Standard Fill as specified as directed before the fill is placed.

Replace excavated material with Standard Fill compacted to 95% MMDD.

### Construction Methods

Fill by the "Compacted Layer” method.

Compacted Layer Method

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

1. Deposit and spread the material in uniform level layers to a maximum thickness of 300 mm loose measurement for the full width of fill.
2. Compact each layer to the specified compaction (refer Table - Dry Density Ratios for Conformance) before placing the next layer.

## Fill Material

### 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 95% MMDD of 20%, to AS 1289, and a plasticity index between 2% and 15%.

### Standard Fill

Conform to the following properties:

|  |  |
| --- | --- |
| PROPERTIES |  |
| CBR 4 day soaked at 95% MMDD at 2.5 mm penetration: | 20 minimum |
| Maximum Particle Size: | 100mm |
| Plasticity Index: | 2% ‑ 15% |

### 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:

| **Table 13.1 - Grading - Select fill** | |
| --- | --- |
| **AS SIEVE (mm)** | **% PASSING (DRY WEIGHT)** |
| 75.00 | 100 |
| 9.50 | 30 ‑ 100 |
| 2.36 | 15 ‑ 65 |
| 0.075 | 5 ‑ 25 |

|  |  |
| --- | --- |
| ***Table – Select Fill Properties*** | |
| CBR, 4 day soaked at 95% MMDD to AS 1289: | 30 minimum. |
| Plasticity Index: | 2 ‑ 15% maximum. |
| Linear Shrinkage: | 2 ‑ 6%. |

### Embankment Fill

Material sourced from the excavation area should comply with the material properties set out below. Materials may be blended to achieve the required distribution to meet the specification.

Conform to the following:

GRADING

| AS SIEVE (mm) | % PASSING (DRY WEIGHT) |
| --- | --- |
| 26.5 | 100 |
| 19.0 | 90 |
| 13.2 | 85 |
| 9.5 | 70 |
| 4.75 | 50 – 85 |
| 2.36 | 35 ‑ 75 |
| 1.18 | 30 – 60 |
| 0.60 | 25 – 55 |
| 0.30 | 20 – 50 |
| 0.075 | 10 ‑ 30 |

PROPERTIES

Liquid Limit: 35%, Plot above the A-Line to 50% maximum.

Plasticity Index: 10%, Plot above the A-Line to 40% maximum.

Emerson Class 4

Pinhole Dispersion ND2

Permeability (K), remoulded to 98% Standard MDD @100% Moisture Content 1x10-8 maximum

CBR, 4 day soaked at 95% MMDD to AS 1289 30 minimum

### Filter Material

The filter material shall be of a sound and durable aggregate with the properties as set out below:

GRADING

| AS SIEVE (mm) | % PASSING (DRY WEIGHT) |
| --- | --- |
| 26.5 | 98 |
| 19.0 | 89 |
| 13.2 | 80 |
| 9.5 | 72 |
| 4.75 | 52 - 92 |
| 2.36 | 33 ‑ 75 |
| 1.18 | 13 - 54 |
| 0.60 | 7 – 35 |
| 0.30 | 0 – 15 |
| 0.075 | 0 ‑ 2 |

PROPERTIES

Maximum Particle Size 30mm

Los Angeles Abrasion Value Coarse Grained <35%

Fine Grained <15%

Sodium Sulfate Soundness <15%

Prior to delivery to site and placement in the Works, the Contractor shall supply information to the Superintendent regarding the source material including testing of the material to demonstrate compliance with the requirements of the specification. The filter material shall be approved by the Superintendent prior to delivery to site.

## EMBANKMENT Filter Geotextile

A geotextile shall be required to surround the filter material as a separation layer. The following Material specifications are required:

* Geotextile shall be non-woven type and shall have filaments bonded by needle punching, heat or chemical bonding processes;
* Geotextile filaments shall be rot proof, chemically stable and have low water absorbency;
* The geotextile shall be UV Resistance such that it retrains 90% of its strength after 1 month’s exposure at the site. The geotextile shall be protected from UV exposure and shall be covered within 24 hours of placement;
* The geotextile shall be placed in accordance with the manufactures recommendations,
* Laps shall be 500mm minimum where joins are required. Geotextile shall be placed in strips with edges buried;

### Geotextile

Conform to the following properties:

| Property | Units | Separation Geotextile Value  (Q Value) |
| --- | --- | --- |
| Grab Tensile Strength | N | >500 |
| Trapezoidal Tear Strength | N | >180 |
| G Rating | - | >900 |
| Flow Rate | l/m2/s | >50 |
| Equivalent Opening Size (EOS – O95) | (μm) | <120 |

## earthworks Protection By Grassing

### Protect earthworks with 100mm topsoil, jute mesh and dryland grassing as shown on the project drawings.

### Seed Mixture and Fertiliser

Provide certified seed complying with the requirements in the LANDSCAPE Section.

Seed Mix to be Dryland Grass

Fertiliser to comply with the TABLE - FERTILISERS in the LANDSCAPE Section.

Apply at rate of 300 kg/ha.

### Grass Seed Application Technique

Conform to the LANDSCAPE Section.

Smooth batters.

Form drains to control stormwater and prevent erosion until batter is grassed.

Repair any erosion.

Reseed areas until establishment is achieved.

## Conformance

### Existing Surface Levels – Witness Point

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

Quantities are based on the existing surface levels prior to the stripping of the top layer.

Allow for suitable material to replace the stripped layer (Cut and Fill) in the items for the EARTHWORKS Section.

### 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.

Foundation surface: Maximum 25 mm below and not above specified level.

Subgrade Width: Not less than specified.

Batter: Not steeper than the specified slope.

Maximum variation at any point from specified plane of batter shall be 150 mm in earth and 300 mm in rock.

Embankment finished top level: Maximum 50 mm above and not below specified level, free of depressions capable of ponding water

Open unlined drain inverts Maximum 50 mm above or below specified level, free of depressions capable of ponding water

Concrete lined drain inverts Maximum 25 mm above or below specified level, free of depressions capable of ponding water

Unpaved Areas: Maximum 75 mm above or below specified level, free of depressions capable of ponding water.

### Proof Rolling – Hold point – Witness Point

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

**Hold point** - submit a proof rolling procedure to the Superintendent for approval including the proposed method of preparing the areas and the extent of proof rolling.

**Witness point** - 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.

### Conformance Testing – Hold point

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

Embankment Fill, Standard Fill and Select Fill

Conformance testing will be based on lots, refer to the CONFORMANCE TESTING section

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.

**Hold point** – obtain the Superintendent’s approval of subgrade conformance prior to placing further material.

# Conformance Testing

## General

The Contractor will be responsible for process control testing.

The Superintendent will carry out all conformance testing nominated to be the Superintendent's responsibility through Panel Period Contracts.

The Contractor will be responsible for ordering the conformance tests.

## Definitions

CBR California Bearing Ratio.

CONFORMANCE TESTING The testing to be carried out by the Superintendent to ensure that the work complies with the contract documents.

ITP Inspection Test Plan

NATA National Association of Testing Authorities, Australia.

NTCP Northern Territory Codes of Practice

NTTM Northern Territory Test Method

NTMTM Northern Territory Materials Testing Manual – available at <http://www.nt.gov.au/infrastructure/publications/materialstesting/documents/Materials-Testing-Manual.pdf>

PROCESS TESTING The testing required to be carried out by the Contractor to ensure that the work is in accordance with the contract documents.

## Standards

Northern Territory Test Methods (NTTM) and NT Codes of Practice (NTCP) for materials testing are given in the Northern Territory DoI Road Projects Materials Testing Manual (NTMTM). The methods contained in the Materials Testing Manual shall take precedence over all other test methods and procedures, and are used in conjunction with relevant Australian Standards.

When testing cannot be performed to the test methods stated below, these methods may be substituted with State Road Authority test methods so testing can be performed.

The following standards, codes and test methods are referred to in this section;

AUSTRALIAN STANDARDS

AS 1141 Methods for testing and sampling aggregates

AS 1141.11.1 - Particle size distribution – Sieving method.

AS 1141.14 - Particle shape, by proportional calliper.

AS 1141.15 - Flakiness index.

AS 1141.18 - Crushed particles in coarse aggregate derived from gravel.

AS 1141.20.1 - Average least dimension - Direct measurement (nominal size 10 mm and greater).

AS 1141.20.2 - Average least dimension - Direct measurement (nominal sizes 5 mm and 7 mm).

AS 1141.23 - Los Angeles value.

AS 1141.24 - Aggregate soundness – Evaluation by exposure to sodium sulphate solution.

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 - Soil classification tests - Determination of the liquid limit of a soil – Four point Casagrande method.

AS 1289.3.2.1 - Soil classification tests – Determination of the plastic limit of a soil – Standard method.

AS 1289.3.3.1 - Soil classification tests – Calculation of the plasticity index of a soil.

AS 1289.3.4.1 - Soil classification tests – Determination of the linear shrinkage of a soil – Standard method.

AS 1289.3.6.1 - Soil classification tests – Determination of the particle size distribution of a soil – Standard method of analysis by sieving.

AS 1289.5.1.1 - Soil compaction and density tests - Determination of the dry density or moisture content relation of a soil using standard compactive effort.

AS1289.5.2.1 - Soil compaction and density tests - Determination of the dry density or moisture content relation of a soil using modified compactive effort.

AS 1289.5.8.1 - Soil compaction and density tests – Determination of field density and field moisture content of a soil using a nuclear surface moisture-density gauge – Direct transmission mode.

AS 1289.6.1.1 - Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil – Standard laboratory method for a remoulded specimen.

AS/NZS 2341 Methods of testing bitumen and related road making products.

AS 2341.2 - Determination of dynamic (coefficient of shear) viscosity by flow through a capillary tube.

AS 2341.3 - Determination of kinematic viscosity by flow through a capillary tube.

AS 2341.4 - Determination of dynamic viscosity by rotational viscometer.

AS 2341.12 - Determination of penetration

AS 2341.13 - Long-term exposure to heat and air.

AS 2891 Methods of sampling and testing asphalt.

AS/NZS 2891.3.1 - Binder content and aggregate grading – Reflux method.

AS/NZS 2891.3.2 - Binder content and aggregate grading – Centrifugal extraction method.

AS/NZS 2891.3.3 - Binder content and aggregate grading – Pressure filter method.

AS 2891.5 - Determination of stability and flow – Marshall procedure

AS/NZS 2891.7 - Determination of maximum density of asphalt

AS 2891.8 - Voids and density relationships for compacted asphalt mixes.

AS 2891.9.1 - Determination of bulk density of compacted asphalt – Waxing procedure.

AS 2891.9.2 - Determination of bulk density of compacted asphalt – Presaturation method.

AS 2891.9.3 - Determination of bulk density of compacted asphalt – Mensuration method.

AS 4049.3 Paints and related materials – Pavement marking materials Part 3: Waterborne paint – for use with surface applied glass beads.

NT CODES OF PRACTICE

NTCP 102.1 Testing field compaction for conformance

NTCP 103.1 Site selection by the stratified random technique.

NT TEST METHODS

NTTM 204.1 Cement content of stabilised materials – Heat of neutralisation

NTTM 204.7 Rate of spread of lime or cement

NTTM 204.8 Stabiliser distribution

NTTM 215.1 Standard ball penetration test

NTTM 216.1 Measurement of layer thickness

NTTM 304.1 Determination of skid resistance with the portable skid tester

NTTM 305.1 Determination of pavement surface texture depth - sand patch method

NTTM 404.1 Retroreflectivity testing of pavement marking

NTTM 404.3 Retroreflectivity testing of pavement marking – wet condition

AUSTROADS TEST METHODS

AGPT04H Austroads Guide to Pavement Technology Part 4H: Test Methods

AGPT/T103 Pre-treatment and Loss on Heating of Bitumen Multigrade and polymer Binders (rolling thin film oven [RTFO] test)

AGPT/T111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)

AGPT/T112 Flash Point of Polymer Modified Binders

AGPT/T121 Shear Properties of Polymer Modified Binders (ARRB ELASTOMETER)

AGPT/T122 Torsional Recovery of Polymer Modified Binders

AGPT/T124 Toughness of Polymer Modified Binders (ARRB Extensiometer)

AGPT/T131 Softening Point of Polymer Modified Binders

AGPT/T231 Deformation Resistance of Asphalt Mixtures by the Wheel Tracking Test.

MAIN ROADS WESTERN AUSTRALIA, TEST METHODS (MRWATM).

WA 730.1 Bitumen Content and Aggregate Grading.

## Specific Tests

Conduct field density testing using Nuclear Density Gauges in accordance with NTCP 102.1 and AS 1289.5.8.1.

Conduct CBR moulding using a compaction rammer / hammer conforming with the requirements of AS 1289.5.1.1 or AS 1289.5.2.1.

Where tests are required that are not included in the manual use the appropriate Australian Standard.

## Panel Period Contractors

The Principal has in place Panel Period Contracts with NATA accredited testing companies. The Superintendent will provide a list of the Panel Period Contractors to be used for conformance testing on this contract when the contract is awarded. The Superintendent reserves the right to use other NATA accredited laboratories when panel contractors are unable to carry out specific tests.

## Ordering Testing

When required, in accordance with the contract documents, order the conformance testing in writing directly from the Panel Period Contractors. Order all testing using the DoI Test Request Form. Include on the order the following information:

* Lot boundaries including start and finish chainages, length and width
* Type of layer
* Type of tests required
* Date and time when lot will be ready for testing

Start with the first Contractor on the list and rotate in sequence for each set of tests. Do not bypass any Panel Period Contractor on the list unless that Panel Period Contractor provides a written explanation that he is unable to carry out the required testing to the time frames listed in the Table “Testing and Reporting Completion Times”. In this instance, the written explanation must be provided to the Superintendent at the same time as the order for testing. Panel Period Contractors that are unable to carry out the required testing will be placed at the end of the rotation sequence.

### Conformance Testing

The Superintendent will pay for all conformance testing directly to the Panel Period Contractor selected to perform the conformance tests required under this contract and nominated as the Superintendent’s responsibility.

If any tests fail to meet specification, all retesting costs will be a negative variation to the contract.

Failures in bitumen tests refer to Superintendent.

When testing has been ordered and the site is not ready for testing at the time specified by the Contractor, the Contractor will bear the cost of time and travel incurred by the Panel Period Contractor and the Superintendent, where applicable.

### Process Testing

The Contractor is responsible for the ordering up and payment for all process tests carried out.

## Notice Of Testing – witness point

Give the Panel Period Contractor written notice in advance of each stage of the works requiring conformance testing, including re-testing.

**Witness point** - Provide the Superintendent with a copy of the order for testing simultaneously with the order being sent to the Panel Period Contractor.

Any communication with the Panel Period Contractors, other than the ordering of testing or inquiring on the timing of test results, must be forwarded through the Superintendent.

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

**Witness point** - Notify the Superintendent prior to any rework of failed lots.

## Table - Test Frequencies, Compliance Testing

Test frequencies as per tables;

Table – Test Frequencies for Bitumen Spray Sealing.

Table – Asphalt Testing Frequencies - During Works

Table – Asphalt – After Works Completion

Table – Number of Cores per Lot

Table - Test Frequencies For Soils – Parts 1 And 2

Table - Test Frequencies For Aggregates And Pavement Surfaces, and

Table - MMDD Curing Times.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table – Test Frequencies for Bitumen Spray Sealing** | | | | | |
| **Test No.** | **Property** | **Cutback Bitumen/ Emulsions** | **Straight Run Binder -Initial Seal on New Works** | **Polymer Modified Bitumen -Initial Seals on New Works** | **Polymer Modified Bitumen -Reseal Works** |
| AS 2341.2,  AS 2341.3 or  AS 2341.4 | Dynamic Viscosity (60ºC) | 1 per 15,000L | 1 per 15,000L | - | - |
| Dynamic Viscosity (135ºC) | - | 1 per 15,000L | - | - |
| AS 2341.12 | Penetration (25ºC) | - | 1 per 15,000L | - | - |
| AGPT/T121 | Consistency (60ºC) | - | - | 1 per 15,000L | 1 per  20,000L |
| AGPT/T121 | Stiffness at 150C (kPa) |  | - | 1 per 15,000L | 1 per  20,000L |
| AGPT/T111 | Dynamic Viscosity (165ºC) | - | - | 1 per 15,000L | 1 per  20,000L |
| AGPT/T122 | Torsional Recovery at 25ºC, 30s (%) | - | - | 1 per 15,000L | 1 per  20,000L |
| AGPT/T131 | Softening Point (oC) | - | 1 per 15,000L | 1 per 15,000L | 1 per  20,000L |
| AS 2341.13 | Durability of base binder | 1 per project | 1 per project |  |  |
| AGPT/T112 | Flash Point (oC) min. | 1 per project | 1 per project | 1 per project | 1 per project |
| AGPT/T103 | Loss on Heating (%mass) max. | 1 per project | 1 per project | 1 per project | 1 per project |
| AGPT/T124 | Toughness at 4oC, 100mm(Nm) min. | 1 per project | 1 per project | 1 per project | 1 per project |

|  |  |  |  |
| --- | --- | --- | --- |
| Table – Asphalt Testing Frequencies - During Works | | | |
| **TEST METHOD NO.** | **TEST METHOD** | **MINIMUM TEST FREQUENCY** | |
| **DAILY PRODUCTION <100 tonnes** | **DAILY PRODUCTION >100 tonnes** |
| - | Mixing temperature | Every mix | Every mix |
| - | Laying temperature | Every 30 minutes | Every 30 minutes |
| - | Asphalt surface temperature at commencement of compaction | Every Mix | Every mix |
| AS 2891.3 or WA730.1 | Bitumen content | 1 No. | 1 per 100 t \* |
| AS 2891.3 or WA730.1 | Particle size distribution | 1 No. | 1 per 100 t \* |
| AS 2891.5 | Stability | 1 No. | 1 per 100 t \* |
| AS 2891.5 | Flow | 1 No. | 1 per 100 t \* |
| AS 1289/NZS 2891.7.1  AS/NZS 2891.7.3 | Maximum Density | 1 No. | 1 per 100 t \* |
| AS 2341.3 | Viscosity of Binder | 1 per shift | 1 per shift |
| \* One test per nominated tonnage or part thereof. | | | |

All sampling is to be performed at the plant from safe sampling platforms.

Binder sampling is to be conducted on the binder in actual use, either at transfer to the bitumen tank on the asphalt plant or from the tank itself.

|  |  |  |
| --- | --- | --- |
| Table – Asphalt Testing Frequencies - After Works Completed | | |
| **Test Method No.** | **Test Method** | **Frequency** |
| AS 2891 | Thickness of layer | 1 per core |
| AS 2891.8 | Air Voids of compacted asphalt layer | 1 per core |
| AS 2891.9 | Insitu Density | 1 per core |
| AGPT04H - AGPT/T231 | Wheel track testing (composite sample) | 1 per Type or 1 per 1000 t |

Carry out density testing as soon as practicable after completion of works.

Do not test within 200mm of an edge and longitudinal joint and within 1 metre of a transverse joint. Do not test odd shaped areas completed by hand placing of asphalt.

Conform to the following number of cores per lot:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table - Number of cores per lot** | | | | | |
| **Area (m2)** | **>5000** | **1000 – 5000** | **500 – 1000** | **50 – 500** | **<50** |
| No. of Cores | 1 per 1000m2 or minimum 10 | 1 per 500m2 or minimum 6 | 4 | 3 | 1 |

| **Type Of Test** | **General Fill** | **Standard Fill** | **Select Fill/Sand Clay Fill** | **Subgrade** | **Sub‑Base** | **Basecourse** | **Embankment Fill** | **Filter Material** | **Culvert Backfill** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Field Density (FDD) by  NTCP 102.1 and  AS 1289.5.8.1  AS 1289.5.3.1 | 1 in 3,000 m2 (min. of 3 tests per lot) | 1 in 3,000 m2 (min. of 3 tests per lot) | 1 in 3,000m2 (min. of 3 tests per lot) | 1 in 1,000 m2 (min. of 3 tests per lot) | 1 in 1,000 m2 (min. of 3 tests per lot) | 1 in 1,000 m2 (min. of 3 tests per lot) | 1 test per 300 m3 (min. of 3 tests per lot) | 1 test per  500 m3 (min. of 3 tests per lot) | 3 tests per 10 m3 |
| 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 |
| Particle Size Distribution by AS 1289.3.6.1 | - | - | 1 per each 2,000 m3 | - | 1 in 5000 m2 (min.of 1 test per lot) | 1 in 5000 m2 (min.of 1 test per lot) | 1 test per  1000 m3 (min.of 3 tests per lot) | 1 test per  500 m3 (min.of 3 tests per lot) | 1 per 300 m3 |
| Atterberg Limits by  AS 1289.3.1.1, AS 1289.3.2.1, AS 1289.3.3.1 | - | 1 per each 2,000 m3 | 1 per each 2,000 m3 | 1 in 5,000 m2 (min.of 1 test per lot) | 1 in 5000 m2 (min.of 1 test per lot) | 1 in 5000 m2 (min.of 1 test per lot) | 1 test per  1000 m3 (min.of 3 tests per lot) | 1 test per  500 m3 (min.of 3 tests per lot) | 1 per each 300 m3 |
| Linear Shrinkage by AS 1289.3.4.1 | - | 1 per each 2,000 m3 | 1 per each 2,000 m3 | 1 in 5,000 m2 (min.of 1 test per lot) | 1 in 5000 m2 (min.of 1 test per lot) | 1 in 5000 m2 (min.of 1 test per lot) | - | - | 1 per each 300 m3 |
| California Bearing Ratio by  AS 1289.6.1.1 | 1 per each 2,000 m3 | 1 per each 2,000 m3 | 1 per each 2,000 m3 | 1 in 5 FDD (min.1 of test per lot) | 1 in 5 FDD (min.1 of test per lot) | 1 in 5 FDD (min.1 of test per lot) | 1 test per  1000 m3 (min.of 3 tests per lot) | - | 1 per each 300 m3 |
| Emerson Class AS1289.3.8.1 | - | - | - | - | - | - | 1 test per  1000 m3 (min.of 3 tests per lot) | - | - |
| Pinhole Dispersion AS1289.3.8.3 | - | - | - | - | - | - | 1 test per  1000 m3 (min.of 3 tests per lot) | - | - |
| Permeability AS1289.3.8.1  AS1289.3.8.3 | - | - | - | - | - | - | 1 test per  1000 m3 (min.of 3 tests per lot) | - | - |
| Sodium Sulfate Soundness  AS1141.24 | - | - | - | - | - | - | - | 1 test per  500 m3 (min.of 3 tests per lot) | - |
| Los Angeles Abrasion Value | - | - | - | - | - | - | - | 1 test per  500 m3 (min.of 3 tests per lot) | - |

|  |  |  |  |
| --- | --- | --- | --- |
| **Table - Test Frequencies For Soils – Part 2 of 2** | | | |
| **TYPE OF TEST** | **PAVEMENT CONSTRUCTION SUBGRADE** | **PAVEMENT CONSTRUCTION SUB-BASE** | **PAVEMENT CONSTRUCTION BASECOURSE** |
| Pavement Layer Thickness by  NTTM 216.1 | - | 1 per FDD | 1 per FDD |
| Ball Embedment by NTTM 215.1 | - | - | 1 in 5,000 m2 |
| Pavement Degree of Saturation  prior to Sealing by AS 1289 | - | - | 1 in 5,000 m2 |
| Stabiliser Spread Rate  by NTTM 204.7 | 1 per run | 1 per run | 1 per run |
| Stabiliser Content by NTTM 204.1 | 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 |
| Stabiliser Distribution by NTTM 204.8 | 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 |
| Soluble Salt Content of Construction Water | - | - | 1 per water source |
| \* run = 1 pass of cement spreader; FDD – Field Dry Density; MMDD – Maximum Modified Dry Density | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Table - Test Frequencies For Aggregates And Pavement Surfaces | | | |
| **TYPE OF TEST** | **PAVEMENT CONSTRUCTION AGGREGATE AND EMBANKMENT FILTER MATERIAL** | **PAVEMENT MARKING** | **PAVEMENT SURFACE** |
| Particle Size Distribution by  AS 1141.11.1 | 1 in 250 t  (Minimum of 3) | - | - |
| 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  (Minimum of 3) | - | - |
| Average Least Dimension by  AS 1141.20.1, AS 1141.20..2 **\*** | 1 in 250 t  (Minimum of 3) | - | - |
| 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  NTTM 305.1 | - | - | 1 in 5,000 m2 |
| Skid Resistance by NTTM 304.1 | - | - | As nominated by Superintendent |
| Roughness | - | - | As nominated by Superintendent |
| Retroreflectivity of Pavement Marking by NTTM 404.1, NTTM 404.3 | - | 1 per 1,000 lin. m | - |
| Wear Assessment of Road Marking Paints – Image Analysis to  AS 4049.3:2005 Appendix K, Method A Photographic Method | - | As nominated by Superintendent | - |
| **\*** Take Average Least Dimension samples only from the stockpile on the project site. | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **Table - MMDD Curing Times** | | | |
| **Material Type** | **Plasticity Index (PI)**  **(AS 1289.3)** | **Field Moisture Content**  **(FMC)** | **Curing time – minimum** |
| Non plastic Sand | PI < 2 | Any | 2 hours |
| Non Plastic Gravels  Absorbent stone | PI < 2 | FMC < 2% MC, below OMC | 6 hours |
| Low Plasticity  Gravel and Sands | PI up to 10 | FMC < 2% MC, below OMC | 6 hours |
| Medium Plasticity  Gravel and Sands | PI 10 to 20 | FMC < 1% MC, below OMC | 12 hours |
| Heavy clays | 20 + | FMC < 2% MC, below OMC | 24 hours up to 7 days |
| MC - Moisture Content; FMC – Field Moisture Content; OMC – Optimum Moisture Content;  MMDD – Maximum Modified Dry Density  Irrespective of FMC all materials must be cured for a minimum of 2 hours, after preparation.  Check and report sub-base and basecourse thickness to nearest 5 mm at each modified compaction test sample site. | | | |

## Conformance Testing Results

The Panel Period Contractor will provide interim and NATA endorsed test results to the Contractor within the following scheduled times (in working days – Monday to Friday) from the time of ordering the tests. The interim test results will comprise of final, completed test results and are not preliminary estimates. Interim test results may not be NATA endorsed.

For work in remote areas increase the testing and reporting completion times by a minimum of 2 days.

|  |  |  |
| --- | --- | --- |
| **Table 14.1 - Testing and Reporting Completion times - Part 1 of 2** | | |
| **Attribute being tested** | **Time Allowed for Interim Report in Working Days (Monday to Friday)** | **Time Allowed for NATA Endorsed Report in Working Days (Monday to Friday)** |
| **SOILS** | | |
| 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 |
| 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 |
| Particle Density and Water Absorption of Fine Aggregate | 3 | 5 |

|  |  |  |
| --- | --- | --- |
| **Table 14.2 - Testing and Reporting Completion Times - Part 2 of 2** | | |
| **Attribute being tested** | **Time Allowed for Interim Report in Working Days (Monday to Friday)** | **Time Allowed for NATA Endorsed Report in Working Days (Monday to Friday)** |
| AGGREGATES (cont’d) | | |
| Particle Density and Water Absorption of Coarse Aggregate | 3 |  |
| Los Angeles Value | 2 | 4 |
| Pavement Surface Texture Depth | 2 |
| Crushed Particles | 2 |
| Sulphate Soundness | 8 | 10 |
| **CONCRETE** | | |
| Consistency of Concrete – Slump Test | 1 | 3 |
| Making, Curing and Compressive Strength (28 day result) | \*\*\* 29 | 31 |
| Making, Curing and Compressive Strength (7 day result) | \*\*\* 8 | 10 |
| **ASPHALT** | | |
| Bitumen Content and Aggregate Grading | 3 | 5 |
| Stability and Flow of Mix | 3 |
| Air Voids and Density Relationship | 4 | 6 |
| Density of Thin Lift Asphalt by Nuclear Gauge | 2 | 4 |
| Bulk Density of Asphalt | 4 | 6 |
| Kinematic Viscosity of Bitumen | 3 | 5 |
| **BITUMEN** | | |
| Dynamic Viscosity (60ºC) | 1 | 3 |
| \*\* Time for completion may be extended by each additional day required for the curing of materials and each additional overnight stay. | | |
| \*\*\* From Date of Sampling. | | |

### Lot Testing

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 defined by the contractor must be clearly marked out on the construction site.

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.

Each lot will be subject to conformance testing in accordance with NTCP 102.1.

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

Quality of the lot will be judged as conformance or non‑conformance of each lot. This will be based on all tests conducted on the lot in accordance with NTCP 102.1.

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

When lots fail to satisfy the conformance criteria, reprocess the entire lot and resubmit 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.

### Conformance of Compaction for Soils

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 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:



*xi*= an individual test result

*n* = the number of results in the lot.

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



where:

*R* = the mean dry density ratio for the lot

*k* = the multiplier in the TABLE. – MULTIPLIER VALUES FOR SOILS.

*s* = the standard deviation.

The Standard Deviation (*s*) is calculated as follows:



where:

*xi*= 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**  Mean Dry  Density Ratio  (R) %  (“n” is 3 to 5) | **B**  Characteristic Mean Dry Density Ratio  (Rc) %  (“n” is 6 or greater) |  |
| Road subgrade, shoulder sub‑base, shoulder base, | 95.0 or greater  94.9 or less | 95.0 or greater  94.9 or less | Conformance  Non‑conformance |
| Sealed pavement basecourse | 100.0 or greater  99.9 or less | 99.0 or greater  98.9 or less | Conformance  Non‑conformance |
| Sealed pavement sub-base, Stabilised basecourse | 98.0 or greater  97.9 or less | 97.0 or greater  96.9 or less | Conformance  Non‑conformance |
| Fill in water retaining embankment | 98.0 or greater  97.9 or less | 97.0 or greater  96.9 or less | Conformance  Non‑conformance |
| Replace unsuitable material beneath water retaining embankment | 98.0 or greater  97.9 or less | 98.0 or greater  97.9 or less | Conformance  Non‑conformance |
| Replace unsuitable material beneath cut off key of water retaining embankment | 98.0 or greater  97.9 or less | 98.0 or greater  97.9 or less | Conformance  Non‑conformance |
| Replace unsuitable material beneath toe filter | 98.0 or greater  97.9 or less | 98.0 or greater  97.9 or less | Conformance  Non‑conformance |
| Over-excavation for culvert penetrating water retaining embankment | 95.0 or greater  94.9 or less | 95.0 or greater  94.9 or less | Conformance  Non‑conformance |
| Diaphragm filter material | 65.0 or greater  64.9 or less | 65.0 or greater  64.9 or less | Conformance  Non‑conformance |
| Culvert backfill for culvert penetrating water retaining embankment | 95.0 or greater  94.9 or less | 95.0 or greater  94.9 or less | Conformance  Non‑conformance |
| Other fills | 95.0 or greater  94.9 or less | 95.0 or greater  94.9 or less | Conformance  Non‑conformance |
| Subgrade for other fills | 95.0 or greater  94.9 or less | 95.0 or greater  94.9 or less | Conformance  Non‑conformance |
| Replace unsuitable material beneath subgrade level for other fills | 95.0 or greater  94.9 or less | 95.0 or greater  94.9 or less | Conformance  Non‑conformance |
| 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 for Soils** | |
| 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 |

### Conformance of Compaction for Asphalt

Relative compaction (R) is the percentage ratio of the insitu density of the compacted asphalt and the reference density of the asphalt for a particular lot. The reference density will be the mean of the maximum density measurements determined from the asphalt testing for a particular lot.

The Characteristic Value of Relative Compaction (Rc) is calculated as follows:



where:

*R* = the mean density ratio for the lot

*k* = the multiplier in table MULTIPLIER VALUES FOR ASPHALT.

*s* = the standard deviation.

The Standard Deviation (*s*) is calculated as follows:



where:

*xi*= an individual test result

*R* = the mean of n results

*n* = the number of test results in the lot.

|  |  |
| --- | --- |
| **Table - Multiplier Values for Asphalt** | |
| Values of the Multiplier k for Characteristic Mean Density Ratio (Rc) | |
| **Number of tests per lot (n)** | **k** |
| 5 or less | 0.0 |
| 6 | 0.719 |
| 7 | 0.755 |
| 8 | 0.783 |
| 9 | 0.808 |
| 10 | 0.828 |
| The work represented by a lot will be assessed as the characteristic value of insitu air voids where:   * Characteristic Value of Air Voids (%) = 100 - Rc | |

## Sampling frequencies for fresh concrete

|  |  |  |
| --- | --- | --- |
| **Table 5.14 - Sampling frequencies for fresh concrete** | | |
| **Type of Test** | **Frequency** | **Number of samples** |
| Slump - AS 1012.3 | Per truck | Per truck as required |
| Making, curing and compressive strength of concrete - AS 1012.8 and AS 1012.9 | 1 truck pour | 1 set of cylinders \* |
| 2 truck pour | 2 sets of cylinders \* |
| 3 - 5 truck pour | 3 sets of cylinders \* |
| 6 - 10 truck pour | 4 sets of cylinders \* |
| 11 + truck pour | 4 sets of cylinders plus 1 additional set of cylinders per every additional 1 to 5 trucks after the first 10 trucks \* |
| \* A set of cylinders consists of 3 cylinders unless directed otherwise. | | |

# Pavements And Shoulders

## Standards

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.

NTMTM NT Materials Testing Manual.

NTTM NT Test Methods

## Definitions

BASE (BASECOURSE): That upper-most layer of constructed material immediately above the subgrade or sub‑base and below the pavement surface (sealed or unsealed) extending for the full width of the pavement and shoulder.

IRI: International Roughness Index

PAVEMENT: That portion of a road constructed for the structural support of, and to form the running surface, for traffic. The pavement structure refers to the pavement layers, in combination, above the subgrade surface, to support the traffic loadings. May be sealed or unsealed. Excludes the shoulders.

SHOULDER: That portion of a road carriageway adjacent to the pavement, and flush with the surface of the pavement. Provides run-off for vehicles from traffic lanes. May be sealed or unsealed.

SUB‑BASE: One or more layers of material placed over the subgrade and below the basecourse extending for the full width of the pavement and shoulder.

## Material PROPERTIES

### Natural 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 Table - Natural Gravel Particle Sizes and the Table - Natural Gravel Properties in the finished condition.

### Table – Natural Gravel Particle Sizes

| **Table – Natural Gravel Particle size** | | | | |
| --- | --- | --- | --- | --- |
| **AS Sieve (mm)** | **Percentage Passing** | | | |
| **Type 1** | **Type 2** | **Type 3** | **Type 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 |

### Table – Natural Gravel Properties

| **Table 15.1 – Natural Gravel Properties** | | | | |
| --- | --- | --- | --- | --- |
| **Attribute** | **Application** | | | |
| **Northern Area - Sealed Base** | **Southern Area – Sealed Base\*** | **Unsealed Base And Shoulder Material** | **Sub-Base** |
| Liquid Limit (LL) | 25% max | 30% | 35% max | 30% max |
| Plasticity Index (PI) | 1-6% | 1 ‑ 10% | 4 – 12 % | 1-10% |
| Linear Shrinkage (LS) | 0-3% | 0 ‑ 6% | 2 – 8 % | 0-6% |
| PI x % passing 0.425 mm Sieve | 180 max | 300 max | 400 max | 400 max |
| California Bearing Ratio (CBR)  4 day soaked (AS 1289) | 80 min | 80 min | 50 min | 30 min |
| at a relative density of | 100% MMDD | 100% MMDD | 95% MMDD | 95% MMDD |
| (Highest CBR value to be reported) | | | | |
| Los Angeles Abrasion (LAA) Loss | 50 max | 50 max | 60 max | 60 max |
| Note: Southern Area- Sealed Base\* applies to south of a line connecting Birrindudu - Dunmarra - Wollogorang. | | | | |

### Fine Crushed Rock

Manufacture from hard rock quarry operations by crushing clean, hard, durable rock, free from natural gravel, clay, organics or other deleterious materials.

Conform to the Table - Fine Crushed Rock Particle Sizes and Table - Fine Crushed Rock Properties in the finished condition.

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### Table – Fine Crushed Rock Particle Sizes

|  |  |
| --- | --- |
| **Table – Fine Crushed Rock Particle Sizes** | |
| **AS Sieve (mm)** | **Percentage Passing** |
| 37.5 | 100 |
| 19.0 | 90 ‑ 100 |
| 13.2 | 75 ‑ 90 |
| 9.5 | 60 ‑ 80 |
| 4.75 | 38 ‑ 60 |
| 2.36 | 25 ‑ 45 |
| 0.425 | 12 ‑ 26 |
| 0.075 | 6 ‑ 14 |

### Table - Crushed Rock Properties

| **Table – Fine Crushed Rock Properties** | |
| --- | --- |
| **Property** | **Value limit(s)** |
| Liquid Limit (LL) | 25% maximum |
| Plasticity Index (PI) | 1 ‑ 6% |
| Linear Shrinkage (LS) | 3% |
| Dust Ratio (DR)  (% passing 0.075 mm)/(% passing 0.425 mm) x 100 | 25 ‑ 50 |
| CBR, 4 day soaked at 100% MMDD at 2.5 mm penetration | 100 minimum |
| Los Angeles Abrasion (LAA) Loss: coarse grained rock  fine grained rock | 35 maximum  25% maximum |
| PI x % passing 0.425 mm sieve | 180 maximum |

### Blends of Natural Gravel and Fine Crushed Rock

Not permitted in urban areas for sealed pavements.

Conform to the Table - Natural Gravel Particle Sizes and the Table - Natural Gravel Properties in the finished condition.

## Construction

### Process Control Testing – Hold Point

**Hold Point -** Provide the Superintendent with a program and procedure for process control testing for the project within 14 days of the awarding of the contract and before work is commenced on site. Base the process control testing on lots and comply with the clause Conformance Of Compaction Of Soils in CONFORMANCE TESTING.

Include the following activities, as applicable:

* On-formation testing, on a lot basis.

Include the following elements of the work in the process control testing program as applicable;

* Fill
* Sub-grade
* Sub-base
* Base course
* Shoulders

Rework and retest failed lots a maximum of two times subsequent to an initial test failure.

Following a third test failure rip up, remove and replace the entire failed layer before carrying out any further testing.

Where relevant, provide additional process control testing procedures for concrete, bitumen and other elements subject to conformance testing by the Superintendent.

The Contractor is responsible for the ordering up and payment of all process testing costs.

Refer to the Conformance Testing clauses in the MEASUREMENT AND PAYMENT section.

### On-Formation 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.

Remove organic materials such as timber, roots and the like by manual stick picking methods.

Do not place material on a previous layer that has

1. become waterlogged or cracked; and/or
2. 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 content level.

### 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.

### Final Pavement Surface

Final pavement layers must be in a homogeneous, uniformly bonded condition free from layering, cracking, disintegration or surface tearing.

The finished pavement layer must be dense, even textured and tightly bonded, free of laminations and roller indentations. The pavement layer must retain these characteristics after rotary brooming and be suitable to receive bituminous surfacing.

Allow the top 75mm of the pavement layer to dry back to a Moisture Ratio (Rm) equal or less than 65% for FCR and 70% for natural gravel.

Moisture Ratio (Rm) is defined as follows:

|  |  |
| --- | --- |
| Rm = | (100 x wf) |
| wr |

where:

Rm = Moisture Ratio, in percent

wf = field moisture content, in percent

wr = adjusted optimum moisture content, in percent.

The Superintendent will carry out all testing to determine the Moisture Ratio.

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.

## SUPPLY TO STOCKPILE

* Comply with the following stockpile requirements;
* Clear the site.
* Ensure the area is free draining.
* Spread and compact a 75 mm thick layer of sub‑base gravel to 95% MMDD.
* Trim stockpile to a uniform shape for ease of measurement.

## Conformance

### Tolerances

|  |  |
| --- | --- |
| **Table *15.2* - Final Surfaces Tolerances** | |
| Final surfaces shall conform to the following: | |
| Level: Kerbed or Asphalt: | 0  mm to +10 mm. |
| Level: Otherwise: | -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: | IRI 2.4 -maximum. |

### Proof Rolling - Notice – Hold Point – Witness Point

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

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

**Witness point;** 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 m2 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.

### Conformance Testing – Hold Point

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.

**Hold point** – 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.

### Ride Quality

Surface Roughness: IRI less than 2.4.

Ride quality requirements represent an absolute upper limit and all field values to be less than value specified.

Lotting and averaging out of field values not permitted.

Rectify all areas where Surface Roughness exceeds specified value.

### Cycle and Pedestrian shared Path

Neatly saw-cut shared path wearing course no less than 1 m either side of line of culvert trench.

Saw-cut only through gaps of key gap kerb.

After culvert construction, reinstate shared path pavement in accordance with the Drawings.

Replace key gap kerb to match existing for line alignment and level.

Line mark reinstated shared path to match existing.

# Spray Sealing

## Standards

Conform to the following Standards and Publications unless specified otherwise:

AS 1141 Methods for sampling and testing aggregates

AS 1141.14 - Particle shape, by proportional caliper

AS 1141.15 - Flakiness index

AS 1141.18 - Crushed particles in coarse aggregate derived from gravel

AS 1141.20.1 - Average least dimension

– Direct measurement (nominal size 10 mm and greater)

AS 1141.20.2 - Average least dimension

– Direct measurement (nominal sizes 5 mm and 7 mm)

AS 1141.23 - Los Angeles value

AS 1141.24 - Aggregate soundness – Evaluation by exposure to sodium sulphate solution

AS 1141.25.1 - Degradation factor – Source rock

AS 1141.26 - Secondary minerals content in igneous rocks

AS 1141.29 - Accelerated soundness index by reflux

AS 1141.40 - Polished aggregate friction value – Vertical road wheel machine

AS 1141.41 - Polished aggregate friction value – Horizontal bed machine

AS 1141.50 - Resistance to stripping of cover aggregates from binders

AS 1160 Bituminous emulsions for the construction and maintenance of pavements

AS 1742.3 Manual of uniform traffic control devices – Traffic control for works on roads

AS 1906.3 Retroreflective materials and devices for road traffic control purposes – Raised pavement markers

AS 2008 Residual bitumen for pavements

AS 2106.2 Methods for the determination of the flash point of flammable liquids (closed cup) - Determination of flash point - Penksy Martens closed cup method

AS 2157 Cutback bitumen

AS 2341 Methods of testing bitumen and related roadmaking products

AS 2341.6 - Determination of density using a hydrometer

AS 2341.9 - Determination of water content (Dean and Stark)

AS/NZS 2341.13 - Long-term exposure to heat and air

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

AS 3706 Geotextiles – Methods of Test

AS 3706.1 - General requirements, sampling, conditioning, basic physical properties and statistical analysis

AS 3706.2 - Determination of tensile properties – Wide strip and grab method

AS 3706.3 - Determination of tearing strength – Trapezoidal method

NORTHERN TERRITORY TEST METHODS

NTTM 215.1 Standard ball penetration test

NTTM 304.1 Determination of skid resistance with the portable skid tester

NTTM 500.2 Procedures for non-conforming test results

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM D86 Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure

ASTM D445 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

ASTM D1298 Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)

AUSTROADS

AGPT04H-08 Austroads Guide to Pavement Technology – Part 4H: Test Methods

AGPT04K-09 Guide to Pavement Technology – Part 4K: Seals

AGPT/T103 Pre-treatment and Loss on Heating of Bitumen Multigrade and polymer Binders (rolling thin film oven [RTFO] test)

AGPT/T108 Segregation of Polymer Modified Binders

AGPT/T109 Ease of Remixing of Polymer Modified Binders

AGPT/T111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)

AGPT/T112 Flash Point of Polymer Modified Binders

AGPT/T121 Shear Properties of Polymer Modified Binders (ARRB ELASTOMETER)

AGPT/T122 Torsional Recovery of Polymer Modified Binders

AGPT/T131 Softening Point of Polymer Modified Binders

AGPT/T132 Compressive Limit of Polymer Modified Binders

AGPT/T142 Rubber content of digested crumb rubber binders - Trichlor bath method

AGPT/T190 Specification Framework for Polymer Modified Binders and Multigrade Bitumens

AP-C87-15 Austroads Glossary of Terms

AP-G41-08 Bituminous Materials Sealing Safety Guide

AP-T235-13 Guide to the Selection and Use of Polymer Modified Binders and Multigrade Bitumens

NT Weeds Management Act

## Definitions

Reference should be made to AUSTROADS - AP-C87-15 Austroads Glossary of Terms to give definitions on all aspects of Bituminous Surfacing works where required.

ADHESION AGENT: A substance used for the purpose of promoting the adhesion between binder and aggregate.

ASTM American Society for Testing and Materials

COARSE GRAINED AGGREGATE: Where the average grain size of the constituent minerals is greater than 1mm. The average grain size is determined optically under a petrographic microscope or by calibrated hand lens.

CUTTER (Kerosene): A light petroleum distillate added to bitumen to temporarily reduce its viscosity.

DEPARTMENT, THE / DIPL Department of Infrastructure, Planning and Logistics.

FINE GRAINED AGGREGATE: Where the average grain size of the constituent minerals is less than 1mm. The average grain size is determined optically under a petrographic microscope or by calibrated hand lens.

FLUX OIL: A petroleum distillate added to bitumen to produce a long term reduction in its viscosity.

NATA National Association of Testing Authorities

NTCP NT Code of Practice

NTMTM NT Materials Testing Manual – available at <http://www.nt.gov.au/infrastructure/publications/materialstesting/documents/Materials-Testing-Manual.pdf>

NTTM NT Test Method

PMB Polymer Modified Binder

PRECOATING MATERIAL: A material used for pre-coating aggregate to promote adhesion of bitumen. Do not use diesel.

PRIME: An application of a Primer to a prepared base, without cover aggregate, to provide penetration of the surface, temporary waterproofing and to obtain a bond between the pavement and the subsequent seal or asphalt. It is a preliminary treatment to a more permanent bituminous surface.

PRIMERSEAL: An application of primer binder with a fine cover aggregate to a prepared base to provide penetration of the surface and retain a light cover aggregate.

RESEAL: A seal applied to an existing sealed, asphalt or concrete surface.

SAMI Strain Alleviating Membrane Interlayer

SEAL: A sprayed application of bituminous binder into which aggregate is incorporated. May include more than one application of binder and aggregate, and may include geotextile fabric.

## Scope

Spray sealing treatments include:

1. Prime
2. Primerseal
3. Enrichments
4. Initial Seal or Reseal:

* With conventional bitumen, cutback bitumen or bitumen emulsion binder
* With modified binder
* Incorporating geotextile fabric reinforcement.

Spray sealing work consists of:

1. Supply and delivery of materials.
2. Storage and handling of raw materials.
3. Precoating of aggregate.
4. Preparation of pavement surfaces.
5. Preparation of bituminous materials.
6. Recording of spray sealing works.
7. Sampling of Bituminous Products
8. Application of primer and/or primerbinder and/or binder.
9. Spreading and rolling of aggregate.
10. Removal of loose aggregate.
11. Traffic Control
12. Installation of temporary pavement markers
13. Installation of after-care signage
14. Traceability of works and materials

## Material Requirements

### Aggregates

Aggregates must be clean, hard, durable, skid resistant, dry crushed stone, or gravel of uniform quality free from noxious weeds and other deleterious material, and conform with the properties specified. Minimum 2 crushed faces.

Nominate source of aggregate supply. Submit to the Superintendent current NATA endorsed test result certificates providing evidence that the nominated aggregate supply conforms to specified properties. Aggregate used for testing must be sampled from project site.

Conform to the Table - Aggregate Grading and Average Least Dimension, And To The Table - Aggregate Properties

### Table - Aggregate Grading and Average Least Dimension

| **Table - Aggregate Grading and Average Least Dimension (ALD)** | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Sieve Size**  **(mm)** | **% Passing (Dry Mass)** | | | | | |
| **Nominal Size of Aggregate** | | | | | |
|  | **20 mm** | **16 mm** | **14 mm** | **10 mm** | **7 mm** | **5 mm** |
| 26.5 | 100 |  |  |  |  |  |
| 19.0 | 85 ‑ 100 | 100 |  |  |  |  |
| 16.0 | - | 80 - 100 | 100 |  |  |  |
| 13.2 | 0 ‑ 15 | 0 – 20 | 85 ‑ 100 | 100 |  |  |
| 9.5 | 0 ‑ 5 | 0 – 2 | 0 ‑ 15 | 85 ‑ 100 | 100 |  |
| 6.7 | 0 ‑ 2 |  | 0 ‑ 5 | 0 ‑ 15 | 85 ‑ 100 | 100 |
| 4.75 |  |  | 0 ‑ 2 | 0 ‑ 5 | 0 ‑ 15 | 85 ‑ 100 |
| 2.36 |  |  |  | 0 ‑ 2 | 0 ‑ 5 | 0 ‑ 15 |
| 1.18 |  |  |  |  | 0 ‑ 2 | 0 ‑ 5 |
| **Min. ALD (1)** | **12.0mm** | **9.5mm** | **8.0mm** | **5.5mm** | **3.5mm** | **2.5mm** |
| Note: (1). Test Methods AS 1141.20.1, AS 1141.20.2 - Direct Measurement. | | | | | | |

### Table - Aggregate Properties

|  |  |  |  |
| --- | --- | --- | --- |
| **Table – Aggregate Properties** | | | |
| **Aggregate Property** | **TRAFFIC COUNT (AADT: TWO LANES)** | | |
| **LESS THAN 300 VPD** | **300 TO 6,000 VPD** | **MORE THAN 6,000 VPD** |
| AS 1141.14 Misshapen Particles: Calliper Ratio 2:1 | 25% maximum | 15% maximum | 12% maximum |
| AS 1141.15 Flakiness Index | 35 maximum | 30 maximum | 25 maximum |
| AS 1141.23 Los Angeles Abrasion (LAA): | | | |
| - Fine Grained Aggregate | 30% maximum | 25% maximum | 20% maximum |
| - Coarse Grained Aggregate | 40% maximum | 35% maximum | 30% maximum |
| AS 1141.24 Sulphate Soundness | 15% maximum | 12% maximum | 10% maximum |
| AS 1141.40/41 Polished Aggregate Friction Value | 40 minimum | 40 minimum | 45 minimum |
| AADT - Annual Average Daily Traffic; VPD - Vehicles Per Day | | | |
| AS 1141.18 - Crushed particles in coarse aggregate derived from gravel. Ensure 80% minimum by mass are classified as crushed particles.  AS 1141.25.1 - Degradation factor – Source rock (Washington Degradation Test). Igneous rocks shall have a minimum value of 50.  AS 1141.26 - Secondary minerals content in igneous rocks shall not exceed 25%.  AS 1141.29 - Accelerated soundness index by reflux. Igneous rocks shall have a minimum value of 94.  AS 1141.50 - Resistance to stripping of cover aggregates from binders. The maximum stripping value of precoated aggregate (precoat shall contain 1% adhesion agent.) shall be 10%. | | | |

### Cutter

Cutter is to be Kerosene or Jet A1 Aviation Turbine Fuel – conform to Table - Cutter Oil Properties.

### Table - Cutter Oil Properties

|  |  |  |  |
| --- | --- | --- | --- |
| **Table – Cutter Oil Properties** | | | |
| Refer AS 3568 – 1999 Table 1 for complete specification requirements. | | | |
| **Property** | **Min.** | **Max.** | **Test Method** |
| Density at 15 oC, km/m3 | 775 | 830 | ASTM D1298, AS 2341.6 |
| Distillation  Initial Boiling Point oC  Final Boiling Point oC | 140 | 280 | ASTM D86 |
| Flash Point oC (Penksy Martens closed) | 38 |  | AS 2106.2 |
| Water content, % by volume | - | 0.1 | AS 2341.9 |
| Viscosity, mPa.s at 40 oC |  | 2.0 | ASTM D445 |

### Precoat and Adhesion Agents

Adhesion Agents are to be in the concentrated form and not contain Diesel as part of the mixture.

Precoat all aggregates to conform to the following:

Precoat mixture is to be 100/0/100/1 and not contain Diesel as part of the mixture.

Bitumen residue (by mass): 50%.

Kerosene (by Mass) 50%

Adhesion agent (by mass): minimum 1%

### Bitumen

Standard Classes of bitumen to conform to the requirements of AS 2008.

Manufacture all AS 2008 bitumens in a refinery and have NATA endorsed certificates of manufacture.

Durability Value in accordance with AS 2341.13 is to be a minimum of 7 days with no maximum value.

Multigrade bitumen to comply with AGPT/T190.

### Cut Back Bitumen

Conform to the requirements of AS 2157 and Table - Cut Back Bitumen Properties.

Designation is by AMC class.

### Table - Cut Back Bitumen Properties

| Table - Cut Back Bitumen Properties | | | |
| --- | --- | --- | --- |
| **Class**  **(AS 2157)** | **Viscosity (Dynamic)**  **at 60oC (Pa.s)** | **Approximate Parts Bitumen to Cutter** | **Spraying Temperature (oC)** |
| **Light** | | | |
| AMC 00 | 0.008 ‑ 0.016 | 100 ‑ 100 | Ambient |
| AMC 0 | 0.025 ‑ 0.05 | 100 ‑ 80 | 35 ‑ 55 |
| AMC 1 | 0.06 ‑ 0.12 | 100 ‑ 50 | 60 ‑ 80 |
| **Medium** | | | |
| AMC 2 | 0.22 ‑ 0.44 | 100 ‑ 40 | 75 ‑ 100 |
| AMC 3 | 0.55 ‑ 1.10 | 100 ‑ 30 | 95 ‑ 115 |
| AMC 4 | 2.0 ‑ 4.0 | 100 ‑ 20 | 110 ‑ 135 |
| **Heavy** | | | |
| AMC 5 | 5.5 ‑ 11.0 | 100 ‑ 12 | 120 ‑ 150 |
| AMC 6 | 13.0 ‑ 26.0 | 100 ‑ 7 | 135 ‑ 160 |
| AMC 7 | 43.0 ‑ 86.0 | 100 ‑ 3 | 150 ‑ 175 |

### Bitumen Emulsion

Conform to the requirements of AS 1160.

Bitumen emulsion to be;

Type; CRS

Binder Grade; 170

%Binder; 60

Utilise within 90 days of manufacture.

Spraying temperature: 60% bitumen content 30 to 60°C.

### Polymer Modified Binder

A mixture of Standard Class bitumen and elastomeric polymer or crumb rubber additive.

All conformance testing to be carried out in accordance with Australian Standard Test Methods.

Base binders for the production of PMB must meet the specification limits outlined in Table- Base Binder For Polymer Modified Bitumen, from the refinery. All base binders must be tested for conformance to ensure compliance before manufacture into PMB’s.

### Table – Base Binder for Polymer Modified Bitumen

|  |  |  |
| --- | --- | --- |
| **Table – Base Binder for Polymer Modified Bitumen** | | |
| **Property** | **Specification limit**  **minimum** | **Specification limit**  **maximum** |
| Viscosity at 60oC, Pa.s | 140 | 380 |
| Viscosity at 135oC, Pa.s | 0.25 | 0.65 |
| Penetration at 25oC (100g, 5s),*pu* (*pu* unit is  0.1mm) | 40 |  |
| Flashpoint oC | 250 | N/A |
| Matter Insoluble in toluene, percent mass | N/A | 1.0 |
| Short Term effect of heat and air  (Rolling Thin film Oven Test)  Viscosity of residue at 60oC as a  percentage of original | N/A | 300 |
| Long term effect of Heat and air, days | 7 |  |
| Density at 15oC, t/m3 | TBR |  |

Polymer Modified Binders must conform to the requirements outlined in Table – Polymer Modified Binders For Sprayed Sealing Applications.

Manufacture of Polymer Modified Binders must meet the requirements of the Guide to the Manufacture, Storage and Handling of Polymer Modified Binders, Australian Asphalt Pavement Association, 2013.

Conform to the Table - Polymer Modified Binders For Srayed Sealing Applications.

### Table – Polymer Modified Binders for Sprayed Sealing Applications

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Table – Polymer Modified Binders for Sprayed Sealing Applications | | | | | | | |
| **Test Method** | **Binder Property** | **PMB CLASS** | | | | | |
| **S10E** | **S15E** | **S20E** | **S25E** | **S35E** | **S45R** |
| AGPT/T121 | Consistency at 60°C (Pa.s) min. | 250 | 700 | 700 | 5000 | 300 | 1000 |
| AGPT/T121 | Underlying Viscosity at 60°C (Pa.s) | TBR | TBR | TBR | TBR | TBR | TBR |
| AGPT/T121 | Stiffness at 15°C (kPa) max. | 140 | 140 | 140 | 95 | 180 | 180 |
| AGPT/T142 | Rubber Content by analysis (%) min | NA | NA | NA | NA | NA | 10 |
| AGPT/T132 | Compression Limit at 70°C, 2kg (mm) min. | NA | NA | NA | NA | NA | 0.2 |
| AGPT/T121 | Elastic Recovery at 60°C, 100s (%) min. | NA | NA | NA | 85 | NA | 25 |
| AGPT/T111 | Viscosity at 165°C (Pa.s) max. | 0.55 | 0.55 | 0.55 | 0.8 | 0.55 | 4.5 |
| AGPT/T112 | Flash Point (°C) min. | 250 | 250 | 250 | 250 | 250 | 250 |
| AGPT/T103 | Loss on Heating (% mass) max. | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| AGPT/T122 | Torsional Recovery at 25°C, 30s (%). | 22 - 50 | 32 - 62 | 45 - 74 | 54 - 85 | 16 - 32 | 25 - 55 |
| AGPT/T131 | Softening Point (°C). | 48 - 64 | 55 - 75 | 62 - 88 | 82 - 100 | 48 - 56 | 55 - 65 |
| AGPT/T108 | Segregation value (%) max. | 8 | 8 | 8 | 8 | 8 | 8 |
| AGPT/T109 | Ease of remixing (%) max | 2 | 2 | 2 | 2 | 2 | 2 |
| Notes:  1. Class of PMB: S=Sealing, E=Elastomeric Polymer, R=Granulated Crumbed Rubber  2. NA means not applicable for that PMB class, TBR = To be reported  3. AGPT Test Methods are available from Austroads Guide to Pavement Technology Part 4H: Test Methods  4. S35E must be manufactured with Polybutadiene (PBD) polymers (To be used only if approved by the Superintendent, as an alternative to S10E). | | | | | | | |

### Geofabric

Use non-woven, polyester, isotropic, needle punched fabric for geotextile reinforced seals.

Conform to the Table – Geofabric Properties.

### Table – Geofabric Properties

|  |  |  |  |
| --- | --- | --- | --- |
| **Table – Geofabric Properties** | | | |
| **Property** | **Test Method** | **Units** | **Value** |
| Mass per unit area | AS 3706.1 | g/m2 | 140 min |
| Wide strip tensile strength in both directions. | AS 3706.2 | kN/m | 8.0 min |
| Elongation range in both directions. | AS 3706.2 | % | 40 – 60 |
| 5% Secant modulus in both directions. | AS 3706.2 | kN/m | 5.0 min |
| Trapezoidal tear strength in both directions. | AS 3706.3 | N | 240 min |
| Melt temperature | - | °C | 250 min |
| Supply certificate of compliance with the respective AE Lot data. Include Traceability of Batch Numbers with the respective AE Lot data. | | | |

## Sprayers And Personnel

Sprayers must have current calibration accredited by a tester nominated on the Australian Asphalt Pavement Association (AAPA) website. All calibrated sprayers must be listed on the AAPA website. A copy of the calibration certificate must be with the vehicle at all times.

Calibrate sprayers yearly.

Ensure sprayer driver and operator are skilled and trained with an understanding of sprayer calibration and an appreciation of the requirements of the work.

Ensure relevant personnel understand the types and quantities of the various materials and mixtures to be used.

Bitumen Spraying plant and equipment must be in good working condition at all times.

Refer to Cycle and Pedestrian Shared Paths in MISCELLANEOUS PROVISIONS.

## Preparation Of Pavement

Remove raised reflective pavement markers. Repair any damage to the pavement surface caused by the removal of raised reflective markers with an emulsion/sand mixture before sealing.

Sweep the pavement surface to remove loose stones, dust, dirt and foreign matter immediately before spraying.

Do not use steel brooms on Fine Crushed Rock type or low plasticity type materials nor on Airstrips.

Maintain the prepared surface.

Extend sweeping clear of the area to be sealed.

Remove adherent patches of foreign material with a steel scraper.

Dampen the prepared surface lightly immediately before spraying (for priming and primersealing only)

Remove water from the surface of primed or sealed pavements before applying binder.

Do not allow traffic on the prepared surface.

## Setting Out

Mark out by string line or paint.

Include pavement widening.

## Binder Coat Requirements

### General

The Contractor must rectify stripping, bleeding or flushing seals during the defined defects period where binder application rates were applied at > than 105% of the designated volume.

### Prime, primer seals and enrichment coats

Cut back as follows:

Prime: AMC 0 to AMC 00

Cut‑back bitumen mixed on site:

Heat bitumen to a temperature appropriate for achieving final spraying temperature making allowance for incorporation of the unheated cutter.

Add unheated cutter to heated bitumen and circulate until a homogeneous mixture is achieved.

Spray immediately circulation is complete.

Allow at least three days to elapse after priming before applying the binder coat.

Keep traffic off the primed surface for this period.

### Straight Run Binder Coats

Provide bitumen Class 320 complying to AS 2008 as follows:

**Cross Reference**

Austroads Technical Report AP-T68/06 – Update of the Austroads Spray Seal Design Method

Austroads - Guide to the Selection and Use of Polymer Modified Binders and Multigrades – AP-T235-13 (2013)

Standard Specification for Roadworks, Spray Sealing (Department of Infrastructure) AS2008 - Bitumen for Pavements (2013)

**Definitions**

S10E – A class of polymer modified bitumen, used for spray seal work, with an elastomeric modifier, conforming to specified binder properties in the Standard Specification for Roadworks It must be manufactured from bitumen that conforms to the classes in AS2008.

SAMI – Strain Alleviating Membrane Interlayer. A layer of seal sprayed onto an existing cracked surface, prior to asphalt resurfacing.

**Priming and Primer Sealing**

|  |  |
| --- | --- |
| **Region** | **Binder Type** |
| All | Class C240/C320\* |

\* - applied in cutback form

**Tack Coat and Enrichment**

|  |  |
| --- | --- |
| **Region** | **Binder Type** |
| All | CRS170/60\*\* |

\*\* - applied in emulsion form

**Initial Seal Work**

|  |  |
| --- | --- |
| **Region** | **Binder Type** |
| Darwin, Katherine, East Arnhem Tennant Creek, Alice Springs | S10E |

**Resealing Work**

|  |  |
| --- | --- |
| **Region** | **Binder Type** |
| All | S10E |

**SAMI Work (Using 14mm aggregate)**

|  |  |
| --- | --- |
| **Region** | **Binder Type** |
| All | S25E |

Selection of binder type other than those specified above can be considered in special circumstances and to the approval of the Executive Director Civil Construction (Chief Engineer) Civil Services. For example, resealing a heavily cracked surface may require a S20E or S25E binder type or crumb rubber S45R.

Material properties for S10E binders and other binder types are contained in the Standard Specification for Roadworks, Spray Seal section.

For further guidance refer to Austroads - Guide to the Selection and Use of Polymer Modified Binders and Multigrades (TT1357 2012)

Heat to spraying temperature, generally between 180°C and 200°C, but do not exceed the maximum. Avoid heating bitumen in quantities excess to requirements

Prevent foaming.

Ensure product meets the requirements of the specification at point of delivery.

### Polymer Modified Binder Coats

### Provide bitumen in conformance with Table – Base Binder for Polymer Modified Bitumen blended with the required polymer as follows:

Prepare the product in a manufacturing or blending plant that complies with the Guide to the Manufacture, Storage and Handling of Polymer Modified Binders, Australian Asphalt Pavement Association, 2013.

1. Initial seal coat: Class S25E
2. Reseal coat: Class N/A

Ensure product meets the requirements of the specification at point of delivery.

Store, mix, heat and spray the polymer modified binder as recommended by the polymer manufacturer.

Both coats of two coat seals shall contain polymer.

### Binder Coats, Tender Quantities

Spray rates used as a basis for calculating tender quantities are as follows:

Prime (use emulsion): 1.0  litres/m2

SAMI Seal Coat

(14  mm aggregate): 1.8  litres/m2

## Sampling of binder – WITNESS POINT

### Test Request

Darwin Urban areas – Test requests are to be sent to the panel period contractor to witness sampling and arrange testing.

All other areas - the supplier is to sample and deliver the sample to DIPL staff within 48 hours.

### Supply of Sampling Containers

Supply all sampling containers as required for sampling purposes.

1. Sample containers are to be leak proof and having a capacity of not less than one litre.
2. Sample containers must be clean, rust free and capable of receiving a product at high temperatures.

### Definition of Sampling

1. A sample is three containers of product collected at the same time from the same supply source.
2. One sample container is for the Contractor’s analysis.
3. Two sample containers are for the Department to analyse.
4. **Note**: Refer to NTTM 500.2 for requirements if samples are non-conforming.

### Frequency of Samples

Refer to CONFORMANCE TESTING section.

### Collection of Samples – Witness Point

Take samples prior to addition of adhesion agents.

Conformance test sampling is to be collected at point of delivery.

Ensure bulker has adequate sampling cocks installed so as samples can be taken on transfer from the bulker to the sprayer. Do not take bituminous samples from the spray wagon, except for prime samples.

**Witness Point** – Take samples from the point of delivery on transfer from the bulker to the sprayer or as directed. Where transfer is for works in the urban area or for small works ensure that conformance testing is ordered and samples are taken at the point of transfer from bulker to sprayer.

All sampling must be in accordance with Australian Standards or Austroads standards. The supplier is to perform the sampling. Ensure staff carrying out sampling are competent in sampling methods.

Ensure sampling techniques do not allow contamination of the samples.

Where samples are not collected, 10% reduction adjustments will apply to the total materials represented. (See Table – Pavement Adjustments, MEASUREMENT AND PAYMENT Section).

### Sample Identification

Samples must be clearly identified with permanent marker on adhesive labels on each tin.

Mark samples with the following information on the container at the time of collection.

1. Container number.
2. Sample number.
3. Date and time of sample taken.
4. Designation or Classification of Materials.
5. Sample Temperature.
6. Tanker/Sprayer Identification Number.
7. Name of Supplier.
8. Road Name and number.
9. Site Identification.
10. Location and Chainage.

### Storage and Delivery of Samples

Store all samples taken to prevent accidental damage or contamination. Submit sample containers at the completion of each days spraying.

### Stockpile Sites

Stockpiles in urban areas are not permitted.

**Urban area for Darwin region is nominated** as North of Cox Peninsular Road (Stuart Highway), West of Trippe Road (Arnhem Highway) and the End of Seal on Gunn Point Road.

Existing stockpile sites – clean to suit.

Provide a separate site for each aggregate size. Allow 15 metres between adjacent sites.

Ensure sites are well drained and on hard ground. Avoid contamination by dust.

For new stockpile sites, construct gravel foundation for stockpiles with 100 mm compacted thickness. Trim and compact to 95% MMDD in accordance with the PAVEMENTS AND SHOULDERS Section. No new stockpile areas are to be constructed without the prior written approval of the Superintendent.

Maintain access roads and stockpile sites.

Do not allow stockpiled aggregates to become wet due to rain. Cover all stockpiles with sheet plastic or similar material.

Avoid sites under trees, telephone lines, overhead transmission lines or where overhead clearance is less than 6 metres.

Clear all vegetation to 5 m beyond stockpile boundary.

Remove from site any non‑conforming aggregate.

For work in or close to regional centres, towns and urban areas (50 km), remove all unused aggregate from stockpile sites at conclusion of work.

For rural work, prepare unused aggregate into one neat and tidy stockpile, per aggregate size. Aggregate remaining in stockpiled areas becomes property of the Northern Territory Government at Practical Completion stage.

## precoating aggregate

All aggregates used must be dry before precoating.

No precoat is required for SAMI and Emulsion seals, unless stated in the response schedules.

Apply a uniform film of precoating material to the all aggregate used for sealing purposes.

Aggregate which has been excessively precoated will be rejected.

Precoating is to take place at pre-approved site stockpile locations unless otherwise approved by the Superintendent.

All precoating must be performed with a powered shaking screen deck precoater, which removes dust, dirt and oversize materials and evenly applies precoat to the aggregate.

Neatly stockpile all waste materials from the screening process.

## adhesion agent

Adhesion agent must be used.

Use 1% adhesion agent in the binder. Written Superintendent approval must be obtained for variation of this rate.

Circulate in binder for 20 minutes before spraying.

Provide the Superintendent a copy of the Safety Data Sheet information of the adhesion agent prior to its intended use.

## spraying – witness point – HOLD POINT

**Witness Point -** Give the Superintendent 48 hours notice of intention to spray bitumen.

Store bitumen at lowest practical temperature and for the shortest possible duration.

Comply with the following temperature control requirements for polymer modified binders:

|  |  |  |
| --- | --- | --- |
| **Table – Temperature Control Requirements for Polymer Modified Binders** | | |
| **Property** | **Straight Run Binder** | **Polymer Modified Binder** |
| Temperature at point of spraying | 175 to 185°C | 180 to 200°C |
| Holding time at spraying temperature | 7 days maximum | 2 days maximum |
| Temperature for medium term storage | 130 to 150°C | 140 to 160°C |
| Holding time for medium term storage | 30 days | 7 to 10 days |

Seek approval to vary these requirements.

Remove bitumen from the site when temperature limits are exceeded.

### Atmospheric Conditions

Commence spraying only when pavement temperature

1. is in excess of 20°C, or
2. has been in excess of 15°C for at least one hour.

For cutback work, commence spraying when pavement temperature is in excess of 10°C.

For emulsion work, commence spraying when pavement temperature is in excess of 5°C.

Cease spraying if rain threatens, or in windy or dusty conditions.

Protect the work in the event of a sudden change in weather by closing the affected section of road or by rigidly controlling traffic speed.

### Preparing the Sprayer

Circulate the mixture.

Check the horizontal and vertical alignment and the cleanliness of the spraybar and its extensions.

Determine the appropriate number of nozzles for the width to be sprayed.

Ensure end nozzles fitted are EAN18W.

Check that the nozzles in use are symmetrical about the sprayer.

Check the alignment and setting of the nozzle to ensure that the fans of material from intermediate nozzles are parallel and at an angle of 30 degrees to the centre line of the spraybar. Ensure that the fans from the end nozzles are parallel to each other and at an angle of 45 degrees to the centre line of the spraybar.

Set the height of the spraybar so that the lower faces of the nozzles are 250 mm (or that specified on the calibration certificate) above the pavement when the sprayer is full.

Fit an end shield to the spraybar to prevent spraying material on the kerb, or to counter any wind effects which would compromise uniform spraying.

Position the guide rod to conform to the setting out and edges of spray. Check by making a dummy run.

### Application Spray Rates – Hold Point

Application spray rates shall be determined by the Superintendent, using appropriate Austroads design methods.

For new seals and reseals, supply the following to the Superintendent, 3 working days prior to the planned commencement of sealing, to allow the spray rates to be calculated:

1. Particle Size Distribution (1 per 250 tonne - minimum 3 tests)
2. Average Least Dimension (ALD) (1 per 250 tonne - minimum 3 tests)
3. Flakiness Index (FI) of the aggregate, (1 per 250 tonne - minimum 3 tests)
4. Ball Penetration testing (for new seal work)
5. Dryback results (for new seal work)
6. Refer to Conformance Testing for sampling requirements of aggregates.

**Hold Point –** Do not commence spraying until the spray rates are advised by the Superintendent.

Spray rates to be at 15°C adjusted in accordance with the table - BITUMEN EQUIVALENT VOLUMES.

For primers, primer seals and polymer modified binders, the rate of application refers to the whole of the mixture, including all modifiers, cutback materials, combining oils and adhesion agents. For enrichments and emulsion seals, the rate of application refers to the whole of the mixture.

### Preparation for Sprayer Run – Witness Point

Record the volume and temperature of the sprayer contents while it is on level ground.

Supply Sprayer Tank dips before and after each sprayer run.

**Witness Point** - Allow visual inspection when requested.

Determine the length of sprayer run from the available quantity in the sprayer and the application rate. Ensure the area to be sprayed is not greater than the area that can be covered by aggregate in the loaded trucks.

Start and finish each spray run on a protective strip of paper placed on the pavement. The paper to be wide enough to ensure the sprayed material is being discharged correctly over the full width of spray. Place sufficient protective paper to protect road fixtures.

Place paper on the pavement and masking around areas to be sprayed or wherever the sprayer is stationary on the road pavement.

Seal joins are only allowed where linemarking is to be placed. No joins are allowed in wheel paths.

Excess overspray and spills must be removed before sealing works proceed.

### Installation of Temporary Pavement Markers

Temporary Pavement Markers to conform to AS 1906.3.

Spacings of temporary pavement markers to be in accordance with AS 1742.3.

### Sprayer Run

Attain uniform spraying speed before spraying commences.

Avoid an excess or deficiency of material due to faulty overlap at longitudinal joints when spraying a road in half‑widths.

Overlap to be 300 mm with an intermediate nozzle.

Do not use end nozzles on an overlap.

Make allowances for “Fog Spraying” when joining to existing seals.

Cease spraying before the level of material in the tank falls to a level which reduces the full discharge of the pump.

Remove and dispose of all paper as per the Environmental Management Plan.

Clean off any sprayed material from road fixtures.

### Hand Spraying

Plan work to minimise the requirement for the use of a hand sprayer.

Any strips of pavement not adequately covered with sprayed material to be sprayed later with the hand attachment.

## Application Of geofabric – hold point

**Hold Point -** Submit details of proposed machinery and method of application.

Overlap longitudinal and transverse joints 150mm minimum.

Place longitudinal joints in the fabric along lane boundaries within 100mm of lane marker. Trim the fabric as required to achieve this.

Bond the fabric to the pavement with a tack coat sprayed 100mm wider than the fabric and in accordance with the Superintendent’s directions for location. Use Standard Bitumen class C320 for the tack coat.

Place the fabric under tension when laying, using suitable machinery, ensuring that folds or creases do not occur. Use equipment to place fabric that does not cause undue migration of the underlying tack coat into the fabric.

Upon completion of placing of fabric and prior to application of the second/top binder coat, roll the fabric with minimum 4 passes of a pneumatic multi-wheel roller. Carry out rolling of the geofabric at a constant roller velocity with no acceleration or deceleration.

Use Standard Class C320 binder for the second / top binder coats.

## Application Of AGGREGATE – Witness Point

**Witness Point -** Load aggregate into appropriate aggregate spreading trucks using a loader which does not contaminate the aggregate with dust, dirt and oversize stone.

Apply aggregate to sprayed binder within:

* 10 minutes where the pavement temperature is 20°C or greater.
* 5 minutes where the pavement temperature is between 15 and 20°C.

Polymer Modified Binders: Apply aggregate within 5 minutes irrespective of pavement temperature.

Apply aggregate to emulsion coat before the emulsion breaks.

Use “cut off plates” on spreader boxes to ensure that the correct widths are covered in aggregate, without overlap.

Apply both coats of two coat seal on the same day or where not trafficked then apply on the following day.

### Aggregate Spread Rates

Spread the aggregate evenly and uniformly over the sprayed surface at a rate complying with Table – Aggregate Spread Rates

Use a mechanical automated spreader, manual spreader boxes are not to be used.

Rerun or hand cover bare or insufficiently covered areas after the first spreading.

Remove all excess aggregate.

### Table – Aggregate Spread Rates

|  |  |  |
| --- | --- | --- |
| **Table – Aggregate Spread Rates** | | |
| **Straight Run Binder Coats** | | |
| **Aggregate Size** | **Traffic Volume** | **Application Rate** |
| 10mm and greater | >200 vehicles/day | 900/ALD m2/m3 |
| 10mm and greater | < 200 vehicles/day | 850/ALD m2/m3 |
| 7mm and less |  | 900/ALD m2/m3 |
| **Polymer Modified Binder Coats** | | |
| **Aggregate Size** | **Traffic Volume** | **Application Rate** |
| 10mm and greater | >300 vehicles/day | 750/ALD m2/m3 |
| 10mm and greater | < 300 vehicles/day | 800/ALD m2/m3 |
| 7mm and less |  | 160 – 200 m2/m3 |
| **Two Coat Seals** | | |
| **Aggregate Size mm** | **Number of Thicknesses** | **Application Rate m2/m3** |
| **First coat** | | |
| >200 vehicles/day |  | 950/ALD |
| < 200 vehicles/day |  | 900/ALD |
| **Second Coat** | | |
| 10 | 1 | 1050 – 1100 / ALD |
| 7 (ALD known) | 1 | 1100 – 1150 / ALD |
| 5 or 7 (no ALD) | 1 | 250 - 300 |
| 5 or 7 (no ALD) | 2 | 175 - 225 |

### Rolling Rate

Roll the treated surface with self‑propelled rubber tyred rollers with a minimum tyre pressure of 600 kPa and a minimum wheel load of 1 tonne.

Roller speed on the first pass to be between 5 and 10km/h, with subsequent passes between 15 and 25 km/h.

Conform to the following:

1. Entire area to receive one roller pass immediately after covering.
2. 75% of rolling within 1 hour of covering.
3. 100% of rolling within 2 hours of covering.

Minimum Rolling Rate: 1 roller hour per 2,000 litres of binder.

Ensure a uniform distribution of aggregate. Drag broom to distribute surplus aggregate but do not dislodge embedded aggregate. Drag broom before 50% of rolling is complete. Drag brooms are not to be rotary brooms.

For two coat seal treatments, double the specified rolling rate..

Roll in daylight hours only.

Sweep all loose aggregate from the carriageway at completion of rolling.

Ensure aggregate on the final surface is uniformly distributed and firmly held by the binder.

Adjust drag broom to distribute surplus aggregate, but not to dislodge embedded aggregate. Ensure aggregate on the final surface is uniformly distributed, and firmly held by binder.

Re-roll the surface after sweeping to ensure uniform bedding of aggregate in binder.

## Traffic on reseals

Cross reference; PROVISION FOR TRAFFIC, WORKZONE TRAFFIC MANAGEMENT, Traffic Escort Vehicle – Reseal Works.

Co-ordinate work to minimise traffic delays.

Prohibit traffic

1. until at least 3 passes of a roller has taken place or until sufficient rolling has taken place to prevent damage to the applied seal, whichever is greater; and
2. from adjacent strip of roadway during spraying.

## Waste Material

In urban areas, remove all excess aggregate by suction broom. Ensure no aggregates are distributed onto the verge.

Remove from the site and dispose of all waste material.

Clean and remove all aggregate from the shoulders and verges in urban areas.

Urban areas aggregate removal / sweeping regime:

**Initial** sweep after rolling has concluded

**Second** sweep after 24 hours

**Third** sweep after 48 hours.

Sweep all aggregate from the extremities of the shoulders in rural areas.

## REPORTING

### Spraysheets

Supply to the Superintendent at the end of each days production spraysheets that record the following information for all spray runs conducted.

1. Contractors Name
2. Project Details
3. Contract Number
4. Specification schedule number
5. Road Name
6. Product Type Sprayed
7. Precoat type used, Precoat litres / m3
8. Aggregate supplier, Aggregate Type, Aggregate size
9. Run number, Start Time of spray run
10. Pavement Temperature, Ambient Temperature
11. Start Chainage of spray run – actual km of road
12. End chainage of spray run – actual km of road
13. Total Length, Width of spray run
14. Total area of spray run
15. Temperature of product at spraying
16. Start Dip, End Dip
17. Total sprayed hot, Correction factor, Total sprayed cold
18. Application rate cold
19. Ordered application rate
20. Percent of application rate ordered
21. Number of rollers used
22. Bitumen sample number
23. Signature of contractor representative
24. Signature section for client representative

## Conformance

### Tolerances

Final surfaces shall conform to the following:

Aggregates are to conform to “Table – Aggregate Properties”

Skid Resistance determined by NTTM 304.1: Not less than Category A as specified in Table 2.

Skid resistance testing may be carried out by the Superintendent.

Final surfaces with non‑conforming skid resistance will be rejected.

Rectify non‑conforming work by methods approved by the Superintendent. Rectification work be at the Contractor’s expense, including the cost of testing.

Remove from the site binder which has been overheated or has deteriorated or become contaminated prior to its application to the road.

Spray rates applied at less than 95% or more than 105% of the rate indicated in the procedure will be rectified by resurfacing at the contractors expense inclusive of all materials.

## adjustment to volumes for spray rates

This includes the prime coat, enrichment coat, emulsion coat, primerseal and seal coats.

Refer MEASURMENT AND PAYMENT clauses for schedules of adjustments.

# Dense Graded Asphalt

## CONTRACTORS RESPONSIBILITIES

The Contractor is responsible for the production and placing of the registered and approved design mix in accordance with the technical requirements of this specification.

The Contractor must undertake conformance testing in accordance with Section 5 and maintain a record of test results in accordance with the Contractor’s Quality System.

## Standards

The following Standards and Publications shall apply unless specified otherwise:

AS 1141 Methods for sampling and testing aggregate.

AS 1160 Bituminous emulsions for the construction and maintenance of pavements.

AS 2008 Residual bitumen for pavements.

AS 2150 Hot mix asphalt.

AS 2157 Cutback bitumen.

AS 2758.5 Aggregates and rock for engineering purposes - Asphalt aggregates.

AS 2891 Methods of sampling and testing asphalt.

AUSTRALIAN ASPHALT PAVEMENT ASSOCIATION (AAPA)

Guide to the manufacture, storage and handling of polymer modified binders

AUSTROADS

AGPT04B Austroads Guide to Pavement Technology Part 4B: Asphalt

AGPT04H Austroads Guide to Pavement Technology Part 4H: Test Methods

AGPT/T103 Pre-treatment and Loss on Heating of Bitumen Multigrade and polymer Binders (rolling thin film oven [RTFO] test)

AGPT/T111 Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)

AGPT/T112 Flash Point of Polymer Modified Binders

AGPT/T121 Shear Properties of Polymer Modified Binders (ARRB ELASTOMETER)

AGPT/T122 Torsional Recovery of Polymer Modified Binders

AGPT/T131 Softening Point of Polymer Modified Binders

AGPT/T190 Austroads Framework Specification for Polymer Modified Binders and Multigrade Bitumen

NT PUBLICATIONS

NTCP 103.1 Site selection by the stratified random technique

NTCP 107.1 Ride Quality

OTHER PUBLICATIONS

MRWA Main Roads Western Australia, Test Methods

## Definitions

|  |  |
| --- | --- |
| COARSE GRAINED AGGREGATE: | Where the average grain size of the constituent minerals is > 1mm. The average grain size is determined optically under a petrographic microscope. |
| FINE GRAINED AGGREGATE: | Where the average grain size of the constituent minerals is < 1mm. The average grain size is determined optically under a petrographic microscope. |
| IRI | International Roughness Index (IRIqc) |
| JOB MIX | Adjusted blend composition of registered mix design based on production trial. |
| NTCP | Northern Territory Code of Practice |
| NTMTM | Northern Territory Materials Testing Manual – available at <http://www.nt.gov.au/infrastructure/publications/materialstesting/documents/Materials-Testing-Manual.pdf> |
| NTTM | Northern Territory Test Method |
| RAP | Reclaimed Asphalt Pavement – a recycled material |
| REGISTERED MIX DESIGN: | An asphalt mix which has been placed on the DoI Asphalt Mix Design Register and approved for use by the Superintendent. |
| WARM MIX ASPHALT | Warm Mix Asphalt (WMA)” is asphalt that contains a warm mix additive, or utilises a warm mix process, that has the ability to reduce the mixing and compaction temperature requirements below the typical temperatures used for that application. |

## Traffic Categories

Unless specified otherwise, the following traffic categories shall be used to determine the required mix design level and binder type.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 9.1 - Mix Type and Binder Type for Traffic Categories** | | | |
| **Traffic Category** | **Mix Type** | **Application** | **Binder Type** |
| Light | 1 & 2 | Cycle paths and pedestrian traffic | Class 320 or S10E |
| Medium | 2, 3 & 6 | Car parking and low volume Traffic and Car Parks – (less than 300 vld) | Class 320 or S10E |
| Heavy | 5 | All Urban Roads and Intersections and Industrial Estates | A15E |

Urban areas are defined as follows:

1. Darwin region urban area is nominated as North of Cox Peninsular Road (Stuart Highway), west of Trippe Road (Arnhem Highway) and the end of seal on Gunn Point Road
2. Katherine, Tennant Creek and Alice Springs urban areas are defined as the town boundaries

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table 17.1 – Mix type designation** | | | | | | |
| **Mix Type** | 1 | 2 | 3 | 4 | 5 | 6 |
| **Aggregate size (mm)** | 7 | 10 | 14 | 20 | 14  (A15E) | 10  (Car Park) |

## Materials

### Coarse Aggregates

Ensure coarse aggregates are clean, hard, high strength, angular, skid resistant, durable crushed stone of uniform quality and free from laminated particles, clay and other aggregations of fine material, soil, organic matter and any other deleterious material. Conform to the following:

Proportion of misshapen particles: 15% maximum at 2:1 calliper ratio.

Los Angeles Abrasion:

* Fine grained aggregate: 30% maximum loss.
* Coarse grained aggregate: 35% maximum loss.

Polished Aggregate Friction Value: 45 minimum.

### Fine Aggregates

Ensure fine aggregates are clean, hard, sharp, washed, durable natural sand and/or material manufactured from crushed stone of uniform quality free from clay and other aggregations of fine material, soil, organic matter and any other deleterious material.

### Mineral Filler

A finely divided mineral material, natural or crushed, hydrated lime or cement with a particle size smaller than 0.075mm.

Use filler that is dry, free from lumps, clay, organic material or any other deleterious material, and complies in all other respects with the requirements of AS 2150.

### Bituminous Binder

Bitumen Class 320, conforming to requirements of AS 2008.

Polymer Modified Binders conforming to the requirements of Austroads Framework Specification for Polymer Modified Binders and Multigrade Bitumen, AGPT/T190. Properties of PMB grades referred to in this specification are outlined in Table – Polymer Modified Binders For Asphalt Applications.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table – Polymer Modified Binders For Asphalt Applications** | | | |
| **Test Method** | **Binder Property** | **CLASS** | |
| **S10E** | **A15E** |
| AGPT/T111 | Viscosity at 165oC (Pa.s) max. | 0.55 | 0.9 |
| AGPT/T122 | Torsional recovery at 25oC, 30 s (%) | 22–50 | 55–80 |
| AGPT/T131 | Softening point (oC) | 48–64 | 82–105 |
| AGPT/T121 | Consistency at 60oC (Pa.s) min. | 250 | 5000 |
| AGPT/T121 | Stiffness at 25oC (kPa) max. | na | 30 |
| AGPT/T121 | Stiffness at 15oC (kPa) max. | 140 | na |
| AGPT/T112 | Flash point (oC) min. | 250 | 250 |
| AGPT/T103 | Loss on heating (% mass) max. | 0.6 | 0.6 |

### Bitumen Emulsion

A rapid setting bitumen emulsion, conforming to requirements of AS 1160.

### Additive

An additive may be proposed provided that full details of the type of additive are provided and the design mix standards of the PROPORTIONING OF MIXES Clause are attained. This must be nominated and shown as part of the mix design at the design approval stage.

### Reclaimed Asphalt Pavement

Crush and screen reclaimed asphalt pavement (RAP) from milling or excavation of existing asphalt as necessary to achieve a well graded, free flowing and consistent product. Ensure a maximum size no greater than the maximum size of the asphalt being produced.

RAP material must not contain tar binder and be free of contaminants such as unbound granular base material, concrete, clay, soil, organic matter or any other deleterious material.

Place processed RAP material in separate stockpiles prior to use. Where RAP material has been stockpiled for some time and is no longer in a free-flowing condition, reprocess to ensure that it is free flowing at the time of use.

## ASPHALT MIX DESIGN – HOLD POINT

### Mix Type and Design Traffic Category

Supply as follows: Mix Type 5 for Wearing Course

Traffic Category; Heavy

### Design Mix Requirements – Hold Point

All asphalt mixes proposed for use on DIPL works shall be registered in accordance with DoI Code of Practice for Registration of Asphalt Mix Designs.

**Hold Point;** No asphalt shall be supplied until the mix has been registered and the Superintendent approves the mix for use.

Approval of a registered mix for use under the Contract does not guarantee the handling properties or performance of the mix nor relieve the Contractor from contractual obligations in regards to rectification of defects.

Notify the Superintendent of any proposed changes to the components or proportions of components used in the registered mix.

New mix designs shall be carried out:

(a) where it is proposed to change the source grading or nature of the components or binders; and

(b) when current registered mix designs are more than two years old.

If a registered mix has unsatisfactory handling or field performance, the Contractor or Superintendent may request the mix be de-registered.

## Surface Preparation – Witness Point

### New Construction – Witness Point

**Witness Point:** Give the Superintendent not less than 24 hours notice of the location and scheduled commencement time of surface preparation works.

Ensure completed surface is constructed to specified density, shape and level.

Base must be tightly bound and free from vegetation and other foreign matter.

Ensure there are no laminations or false pavements and pavement is dried back to the requirements of PAVEMENTS AND SHOULDERS, CONSTRUCTION, Final Pavement Surface prior to application of prime coat.

Broom the surface thoroughly and remove any foreign matter not swept off by the brooming.

Prime the surface as specified in the SPRAY SEALING Section.

Fill depressions greater than 25 mm with a correction course of asphalt.

### Resurfacing of Existing Bitumen and Concrete Surfaces

Remove all vegetation, loose and extraneous matter.

Fill depressions greater than 25 mm with a correction course of asphalt.

### Cold Planing

Unless otherwise specified or directed by the Superintendent, cold planing shall be carried out in such a manner as to leave a uniform surface parallel with the specified ultimate finished surface of the pavement.

Sweep the planed surface clean of all loose material prior to placing asphalt.

Exposed granular material shall be watered, re-compacted and, where specified, primed or surfaced with a 7 mm emulsion seal prior to pacing asphalt.

Prior to opening to traffic, excavated areas shall be filled with asphalt and compacted flush with the existing pavement in accordance with COMPACTION.

Where the cold planed surface is to be opened to traffic due to breakdown of supply and placing of asphalt, the surface must be cleaned of all loose material and temporary backfill or ramps provided for safe passage of traffic. Remove all temporary materials prior to placing new asphalt.

For the purposes of the application of the ride quality provisions of this specification, asphalt surfacing following correction of surface shape by cold planing is designated as new work. Refer PROJECT SPECIFIC clauses for designated areas of cold planing excluded as new work.

### Tack Coat

Apply a fine spray of bitumen emulsion lightly and evenly over the whole of the area to be covered with asphalt.

The pavement must be dry and dust free before any application of tack coat.

Apply tack coat by spray bar fitted to mechanical sprayer. Hand spray only in areas where it is impractical to use a spray bar.

Protective splash boards or spray skirts must be used to eliminate over spray beyond the surface where tack coat is being applied.

Application rate (Residual Binder): 0.1 – 0.2 litres/square metre unless otherwise directed.

Allow the tack coat to ‘break' before laying the asphalt.

Clean and tack coat existing surfaces against which new work is to be laid.

Re-apply Tack coat where damaged by construction traffic or weather.

## Mixing

Mix in a plant capable of consistently producing asphalt that complies with the approved job mix design.

### Table – Acceptable Temperature Ranges by Materials

|  |  |  |
| --- | --- | --- |
| **Table – Acceptable Temperature Ranges by Materials** | | |
| **Material** | **Minimum Temperature (°C)** | **Maximum Temperature (°C)** |
| Class 320 Bitumen | 150 | 170 |
| S10E PMB | 150 | 175 |
| A15E PMB | 160 | 175 |
| Asphalt at discharge from asphalt mixing plant | 135 \* | 170 |
| \* Minimum of 130°C when produced as warm mix asphalt | | |

## Transport And Supply

### Transport

Ensure that truck trays are clean to permit easy discharge and that transport mix trucks are free from oil leaks.

Cover asphalt during transport to reduce the rate of cooling of the mix.

Fit each truck with an adjustable tailgate to allow control of the mix during discharge into the spreading device.

Ensure delivery dockets provide traceability for each load, including a record of:

* Docket Number
* Time of Departure
* Temperature at manufacture
* Product Type include Bitumen Type
* Mass of Materials – Individual load and Progressive Tonnes

### Rate of Supply

Deliver the mix at a uniform rate within the capacity of the spreading and compacting plant.

Rate of delivery must allow continuous placing of the mix having regard to;

* the number of haulage vehicles available; and
* the haulage distance to the work.

Minimise cooling of the mix by prompt delivery.

## Spreading - WITNESS POINT

### General

Lay the final surface layer at a uniform thickness, and as one continuous operation where practicable.

Construct a transverse joint whenever the operation ceases.

Remove from site, prior to initial rolling, asphalt that has cooled below the required initial rolling temperature.

Cease laying asphalt during heavy or continuous rain, or in wet conditions where the material will not adhere or key to the surface.

Remove from site all excess or spilt asphalt.

### Mechanical Spreading

Provide a self‑propelled paving machine having an effective capacity of not less than 250 tonnes per eight hour day.

Paving machines must be equipped and operated with automatic joint matching facility.

### Hand Spreading

Hand spread only in locations where spreading with a paving machine is impractical, and to correct localised depressions or irregularities.

### Laying Pattern

Complete the work as one continuous operation where practicable.

**Witness Point** - Supply construction program plans 7 working days prior to commencement of works. Confirm paving plan prior to the commencement of each shift.

### Joints Generally

Minimise the number of longitudinal and transverse joints.

Do not leave longitudinal joints on a pavement in use by traffic.

Joints are not to be placed in wheel paths.

Joints are not to be placed at Intersections where practicable.

Offset the joints in multiple layer work by at least 100mm so that joints in the surface course do not overlay joints in the previous course.

Overlap the finished asphalt by 25mm to 75mm when spreading.

Push the overlap asphalt back immediately to form a ridge along the joint.

Roll the ridge to form a smooth level joint.

Remove excess asphalt prior to final rolling.

Prevent the accumulation of coarse particles along the joint by raking.

### Transverse Joints

Form transverse joints by cutting the end of the spread material to a vertical face and remove loose material.

Ensure transverse joints are level using a 3 metre straight edge and cut back to the true level surface with no deviation. Minimum of 200mm or to match cross fall.

Check the surface adjacent to the joint with a straight edge and correct any surface defects immediately.

Treat the face of the joint with bitumen emulsion tack coat prior to spreading adjacent section.

Transverse Match of Overlay to Existing Pavement:

* Saw cut existing asphalt pavement 20mm depth along the match line of joint.
* Remove taper wedge of existing asphalt pavement along the overlay side of match joint.
* Feather the asphalt overlay down to the existing pavement to achieve a maximum slope of 1 in 10 and for the full width of the pavement.
* Ensure depth of overlay above existing pavement in taper wedge area is not less than 20 mm.

### Longitudinal Joints

Keep longitudinal joints straight or follow the line of curvature.

Minimise the unsupported length left overnight.

Rectify broken sections of unsupported edge by cutting a vertical face before resuming laying.

Treat the face of the joint with bitumen emulsion tack coat prior to spreading adjacent section.

### Temporary Ramps

Provide ramps of compacted asphalt with a maximum grade of 1% relative to pavement grade, where transverse joints are left overnight on trafficked pavements.

Longitudinal Ramps are to be a minimum of 300mm when under traffic control.

No temporary longitudinal ramps are to be left unattended.

## Compaction

### Compaction Generally

Compact by using adequate pneumatic tyred and tandem steel wheeled rollers to achieve the specified compaction.

Stand compaction plant clear of the new asphalt surface.

Remove from site plant with fuel or oil leaks.

Defer rolling if excessive displacement of the asphalt occurs but only until the asphalt has cooled sufficiently to permit rolling to continue.

### Compaction Temperatures

Compact the asphalt uniformly as soon as the asphalt has cooled sufficiently to support the rollers without undue displacement. Achieve compaction using suitable sized steel wheeled or vibratory rollers or combination of steel wheeled or vibratory rollers and pneumatic tyred rollers. Conform to the standards specified in the Compaction clauses (these clauses) and Conformance clauses in this section.

### Initial Rolling

Roll immediately behind the spreader using a steel wheeled roller.

Ensure there is no adverse displacement or cracking during all roller operations.

Provide steel wheeled rollers with adjustable scrapers and keep the drums moist with water.

Prevent the mix from sticking to the drums.

Avoid ponding of water on the pavement surface.

The first breakdown pass of the roller shall be undertaken by a steel drum or vibratory roller with the vibrating function disengaged.

### Intermediate Rolling

Roll with a self‑propelled pneumatic tyred roller.

Ensure tyre pressures are uniform.

Ensure that rolling surfaces are smooth.

### Final Rolling

Roll with a steel wheeled roller to remove all roller marks from the surface.

### Joint Compaction

Compact all joints and edges.

Do not roll unsupported edges with vibratory plant in order to minimize loss of shape and displacement.

Roll all joints to obtain a level surface not exceeding 5 mm deviation under 3 m straight edge of the finished pavement surface.

### Hand Tampers

Compact by vibratory plates or hand tampers in locations inaccessible to rollers.

Side tamp before rolling the edge of all asphalt which is not laterally supported.

Finish hand tamped surfaces smoothly and conforming with machine finished areas.

## Conformance

### Conformance Testing

The Contractor is responsible for process control testing.

The Superintendent will carry out all conformance testing through the Panel Period Contract.

The Contractor is responsible for ordering the conformance tests.

Order testing on the “Conformance Test Request” form, giving a minimum of 2 working days notice.

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

When lots fail to satisfy the conformance criteria, payment adjustments or rejection of the lot shall be in accordance with the Payment Adjustments clause in the MEASUREMENT AND PAYMENT section.

### Process Testing

Upon request supply the Superintendent with test reports for all process testing performed on the works.

### Finished Pavement Properties

|  |  |
| --- | --- |
| **Table – Finished Pavement Properties** | |
| Finish pavement surfaces smooth, dense, true to shape and to the following tolerances; | |
| Thickness: | Average not less than specified. |
| Surface levels: | maximum deviation from design level 0 to +10 mm |
| Surface roughness  (NTCP 107.1): | 2 IRI – mean value of lot for new works 2.5 IRI – mean value of lot for resurfacing work. |

Surface Shape Requirements:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Table - Surface Shape Requirements** | | | | | | |
| **Layer** | **Deviation Below 3m Straight Edge (mm)** | | | | | |
| **Freeways and Highways with High Speed Traffic** | | **Heavy and Very Heavy Traffic Roads** | | **Medium and Light Traffic Roads** | |
| **Parallel to Centreline** | **Transverse to Centreline** | **Parallel to Centreline** | **Transverse to Centreline** | **Parallel to Centreline** | **Transverse to Centreline** |
| Wearing Course | 3 | 5 | 5 | 7 | 7 | 10 |
| Intermediate and Base | 6 | 10 | 8 | 12 | 12 | 16 |

### Conformance on Asphalt Production

Conform to following variation limits to the approved Job Mix Design:

|  |  |
| --- | --- |
| **Table - Variation Limits To The Approved Job Mix Design** | |
| **Grading:** | |
| **AS SIEVE (mm)** | **% PASSING (by mass)** |
| 4.75 or larger | + or - 7 |
| 2.36 | + or - 5 |
| 1.18 to 0.30 | + or - 4 |
| 0.15 | + or - 3 |
| 0.075 | + or - 2 |
| **Bitumen Content:** | Maximum variation 0.3% by mass to the Approved Job Mix Design: |
| **Maximum Density:** | Maximum variation 5% by mass to the Approved Job Mix Design |

### Conformance Sampling and Testing Frequencies

The Superintendent will undertake conformance sampling with samples taken from trucks at the mixing plant. Refer CONFORMANCE TESTING section for frequencies of testing.

### Conformance of Compaction

Base the conformance of compaction on lots, determined from cores.

Subdivide all items of work into lots, and provide such information to Superintendent.

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 the lot on the lot register.

Select lots of work based upon the following criteria;

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

Each lot will be subject to conformance testing.

Lots will be checked for level tolerance.

Quality of the lot will be judged as conformance or non‑conformance of each lot including all tests conducted on the lot.

When lots fail to satisfy the conformance criteria, payment adjustments or rejection of the lot will be in accordance with the Payment Adjustments clause in the MEASUREMENT AND PAYMENT section.

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

Treat non‑conforming lots, which are subdivided after testing as separate lots and retest each and every subdivided lot.

Core sample locations will be selected by the laboratory on a stratified random basis in accordance with NTCP 103.1. Supply copies of the completed stratified random selection with each compaction report.

Carry out density testing as soon as practicable after completion of works. The work represented by a lot will be assessed as the characteristic value of insitu air voids where the Characteristic Value of Air Voids is calculated in accordance with the CONFORMANCE TESTING section.

Conform to the following Characteristic Value of Air Voids:

|  |  |  |  |
| --- | --- | --- | --- |
| **Table - Characteristic Value of Air Voids** | | | |
| **Reduction Level** | **Light Traffic** | **Medium Traffic** | **Heavy Traffic** |
| Conformance | 3.0 – 9.0 | 3.0 – 9.0 | 3.0 – 8.0 |
| Reduction Level 1 | 9.1 – 9.5 | 9.1 – 9.5 | 8.1 – 8.5 |
| Reduction Level 2 | 9.6 – 10.0 | 9.6 – 10.0 | 8.6 – 9.0 |
| Reduction Level 3 | 10.1 – 11.0 | 10.1 – 11.0 | 9.1 – 10.0 |

The Conformance Of Compaction clause only applies for specified minimum 30 mm asphalt thickness.

# Miscellaneous Concrete Works

## 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 1478.1 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

NTMTM NT Materials Testing Manual

NTTM NT Test Methods

## General

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

## Materials

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

### 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.

### Fine Aggregate

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

### Coarse Aggregate

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

### Water

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

### Chemical Admixtures - Hold Point

**Hold Point -** Do not use admixtures without obtaining prior written approval from the Superintendent.

Admixtures and their use must conform to AS 1478.1.

Where two or more chemical admixtures are proposed for incorporation into a concrete mix, their compatibility must be certified by the manufacturers.

Store admixtures in accordance with the manufacturer’s recommendations.

### Reinforcement – Hold Point

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.

**Witness point** - Do not place concrete until the reinforcement has been inspected by the Superintendent.

### Recycled Crushed Glass (RCG)

Clean, hard, durable RCG free from clay, dirt and organic material. Source the material from glass food and beverage containers, drinking glasses, and window (or flat) glass and plain ceramic. Do not use glass from hazardous waste containers, reinforced and laminated glass, light bulbs, fluorescent tubes and cathode ray tubes. The source glass must be free of debris and contaminants such as paper and cardboard, plastic, fabrics, residues from original contents and toxins.

Use RCG conforming to Specifications for Recycled Crushed Glass as an Engineering Material Section 9 available via <https://infrastructure.nt.gov.au/specification-services>

## Concrete

Refer to CONFORMANCE TESTING for sampling frequencies for fresh concrete.

### 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 unless noted otherwise on the drawings

Aggregate size: 20 mm.

Slump: 80 mm, + or - 15 mm.

Conduct slump testing on site for each and every truck.

### Addition of Admixtures

Refer to Clause - **Chemical Admixtures**

Chemical admixtures may only be added subsequent to slump test compliance confirmation. A further slump test post admixture addition may also be required.

Where Superintendent approval has been granted for the addition of superplasticisers at the plant prior to dispatch of concrete, a slump test of each batch must be performed and recorded by a NATA accredited testing laboratory prior to the addition of the superplasticiser. The slump test report shall record the time of the addition of the superplasticiser, amount of superplasticiser added and product identification.

Do not add chemical admixtures unless the exact amount required is measured using a regularly maintained and calibrated device of the required accuracy.

Make allowance for the reversion time of superplasticisers. Delay the addition of superplasticisers as long as practicable before the concrete is discharged from the mixer.

Agitate concrete for at least 5 minutes following the addition of superplasticiser before dispensing.

## Foundations

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

## Construction

### Kerbs and Gutters

Construct kerbs and gutters as integral units.

### Formwork – Witness Point

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.

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

### Placing of Concrete – Witness Point – Hold Point

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

**Hold Point** - 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 °Celsius, or if the ambient air temperature exceeds 40 °C..

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

|  |  |
| --- | --- |
| **Table - Maximum Time To Place Concrete After Mixing** | |
| **Concrete Temperature At Time Of Placing** | **Maximum Time**  **(minutes)** |
| 25°C to 28°C | 75 |
| 28°C to 32°C | 60 |
| 32°C to 35°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.

### 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:

Footpaths: 6 m spacing maximum.

At junctions with other concrete structures

Inverts: 15 m spacing maximum.

All other works: As shown on the drawings.

tooled JOINTS

Provide tooled joints as follows:

1. Transverse vertical grooves 20 mm depth minimum.
2. Joints at right angles to outer edge of concrete works.

Footpaths: 2 m spacing maximum.

Kerbs/Inverts: 3 m spacing maximum.

All other works: As shown on the drawings.

### 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.

Smooth tumbled RCG used as an exposed aggregate surface finish.

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 |  |
| F3 | Exposed RCG | Application of RCG to be hand spread once application of the exposed mix has been bull floated.  RCG to be measured 1000 grams per square meter, or as otherwise specified by the Superintendent.  Colour and size of RCG to be specified by Superintendent. |

### 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:

1. flooding;
2. continuous spraying with water; or
3. 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.

### Backfilling

Backfill areas around the concrete with Select Fill material.

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

Reinstate damaged grassed areas with topsoil and grass seed.

## Rain Damage

Remove and replace rain damaged concrete.

## Existing Services – hold point

**Hold point** - Obtain the Superintendent's approval before altering the line or level of existing services.

Place an expansion joint between concrete works and service.

## 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 3 mm maximum in 3 m

of surface: 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.

## 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

## 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/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

AS 5100.5 Bridge Design - Concrete

NTMTM NT Materials Testing Manual.

NTTM NT Test Methods

AUSTROADS

AGBT Set Guide to Bridge Technology.

ARRB

Specifications for Recycled Crushed Glass as an Engineering Material

WorkSafe Australia Excavation Work Code of Practice

## Definitions

CULVERT: An underground pipe, box or arch constructed in an embankment or trench.

CULVERT SKEW ANGLE: The angle between a line drawn perpendicular or radial to the road centre line and the centre line of the culvert.

CULVERT CHAINAGE: The chainage measured along the road centre line at its intersection with the culvert centre line.

LARGE BOX CULVERTS: Precast box culverts and link slabs having spans greater than 1200 mm, heights greater than 900 mm or fill heights exceeding 1600 mm.

RECYCLED CRUSHED GLASS (RCG): RCG conforming to Specifications for Recycled Crushed Glass as an Engineering Material Section 9. A copy is available via <https://infrastructure.nt.gov.au/specification-services>

TOM(S) Devices used to hold pipe culverts in place during backfilling of

trenches.

Also;

Horizontal device(s), such as timbers, metal struts, hydraulic spreaders, etc, spanning across an excavation for holding soldiers (vertical timbers) or walings (horizontal timbers) in place against the sides of trenches before and during trench backfilling.

## 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.

## Clearing

Clear the site as specified in the CLEARING, GRUBBING AND REHABILITATION Section.

## Materials

Conformance testing will be the responsibility of the Contractor.

Ensure that all pipes and box culverts are indelibly marked with a Standards Australia conformance stamp.

Pipes and box culverts not stamped shall be removed from site at the Contractor's expense.

### Precast Reinforced Concrete Pipes

Pipes to be flush joint type with external rubber bands..

Pipes to be clearly marked as to their class.

### Precast Reinforced Concrete Box Culverts – Hold Point – Witness Point

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 1200 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 NT 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 following exposure classification (AS 5100.5 Exposure Classifications table): B1.

The Contractor shall confirm the size of the culverts required to extend Culvert 2 into lot 4294.

Where box culverts are required to be used with link slabs as shown on the Drawings, the link slabs shall be rebated in accordance with the manufacturer’s recommendations.

**Hold point** - Provide drawings showing complete reinforcement and dimensions with tolerances and obtain the Superintendent’s approval prior to fabricating any units. Provide manufacturer’s certification that the provided culverts comply with the applicable sections of AS 5100.5 and with AS 1597. 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.

**Witness point** - Give the Superintendent notice prior to casting concrete.

### Corrugated Steel Pipes, Pipe Arches and Arches

Nil required

Supply in accordance with the details specified.

Assemble in accordance with the manufacturer's instructions.

### Bedding

Culverts not passing through water retaining embankment:

Bedding material to be one of the following:

* 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, or
* RCG conforming to Specifications for Recycled Crushed Glass as an Engineering Material Section 9, or
* Mix blend of RCG conforming to Specifications for Recycled Crushed Glass as an Engineering Material Section 9, and 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 |

Culverts passing under water retaining embankment

Culverts shall be founded on compacted embankment compacted to 95%MMDD at 1% to 2% wet of OMC and as shown on the Drawings.

### Concrete

Conform to the requirements of the MISCELLANEOUS CONCRETE WORKS Section.

### Mortar

Use one part fresh cement and three parts clean sharp sand mixed with potable water to yield a stiff but workable mixture.

### Select Fill

Conform to the requirements of the EARTHWORKS Section.

### Rubber sealing strips

Provide 25 mm × 25 mm low expansion sealing gasket Conseal CS231 by Parchem or equivalent for use in sealing culverts where passing under the water retaining embankment.

### Denso tape sealing strips

Supply 150 mm wide Denso ULtraflex 1500 sealing tape or equivalent to culvert manufacturer’s recommendations

### Sikadur 31 epoxy adhesive and repair mortar

Supply Sikadur 31 or equivalent 2-part epoxy adhesive and repair mortar.

## Construction Of Culverts And Structures

### Setting Out – Hold Point

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.

**Hold Point** - Obtain the Superintendent's approval for the setting out before construction.

### Excavation – Witness Point

Excavate in whatever material is 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.

**Witness point** - Excavate unsuitable material below specified level if directed by the Superintendent.

Replace with select fill, compacted as specified.

### Culverts penetrating water retaining embankment

Construct the culvert when water retaining embankment fill has been placed to 300 mm above the design level of the top of culvert or maximum embankment height if less.

Over‑excavate under line of culvert through water retaining embankment to a depth of 0.50 m as shown on the Drawings. Replace with Embankment Fill at 95% MMDD at 1% to 2% wet of OMC.

### Culverts in Fill under Other Construction

Use select fill. Conform to Compacted Layer Method in EARTHWORKS. Excavate the fill in accordance with the Excavation clause in this section to permit the construction of the culvert.

### Construction Loading on Culverts

Backfill and compact over culverts to the full height and reinstate as shown on the drawings 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.

### Bedding

Place bedding 75mm compacted thickness for the full width of the trench or 0.6m greater than the width of the culvert for non‑trench conditions.

Under water retaining embankment, compact bedding as specified in Culverts Penetrating Water Embankment Section 19.6.3.

Beyond water retaining embankment, compact bedding to 90% MMDD.

Shape the bedding to hold pipes in position during compaction of additional fill.

Place and compact a further (haunching) layer of bedding of 150mm compacted thickness over the full width of the previous layer after the pipe is in position.

Place bedding for culverts under the water retaining embankment in accordance with the Drawings.

### Laying Generally

Lay culverts commencing from the downstream end.

### 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 1200mm 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.

### 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. Include haunching to restrain the box culverts from lateral movement in accordance with the culvert manufacturer’s recommendations.

Butt box culverts firmly together. Cut away lifting hooks and seal over the affected area with an approved epoxy resin.

CULVERTS UNDER WATER RETAINING EMBANKMENT

Where culverts pass under the water retaining embankment, apply a strip of Parchem Conseal 231 or equivalent over the ends of the culvert over the full height of the culvert before making the butt joint.

Where box culverts pass under the water retaining embankment, provide a tight waterproof seal between the culvert crowns and the base using Parchem Conseal 231 (Supply no. 2502210) or equivalent in accordance with manufacturer’s recommendations.

Where box culverts pass under the water retaining embankment and where link slabs are shown on the Drawings, place the link slab over a continuous strip of Denso sealing tape or equivalent to form a tight waterproof seal between the link slabs and the box culverts they bear on. Apply Sikadur 31 epoxy adhesive and repair mortar (or equivalent) as a sealant to the outside of the joint.

Remove excess Sikadur from the top and sides of the culvert and apply external joint seals, Denso Ultraflex 1500 or equivalent, 150mm wide.

CULVERTS ELSEWHERE

Where box culverts do not pass under the water retaining embankment, fill all joints with a stiff mortar firmly rammed into the openings. Remove excess mortar from the top and sides of the culvert and apply external joint seals, Denso Ultraflex 1500 or equivalent, 150 mm wide.

Where multiple runs of box culverts require culverts to be placed side by side, space culvert runs 25 mm apart and fill the space with stiff mortar in accordance with MORTAR. Scrape off excess mortar at the top of the joint to allow a smooth surface. Apply 150 mm wide Ultraflex 1500 or equivalent external joint seals across the top of all culverts and the sides of the outermost culverts.

### Connection to Existing Systems - Witness Point

Repair all cut openings and make watertight.

Demolish existing headwalls, including endwalls, wingwalls and aprons, to make way for the extension of the culvert. Remove one culvert run or grind the existing culvert back to expose a smooth end surface, with no exposed reinforcement. Prepare the base and pour a new reinforced concrete base slab in accordance with the Drawings. Lay new culverts, butting up against existing in accordance with LAYING BOX CULVERTS.

Clean out new work and existing work affected by the new work.

**Witness Point**  - Advise the Superintendent within 2 days of when cleaning out is completed.

### Backfill – Witness Point – Hold Point

**Witness Point** - Notify the Superintendent before backfilling where holes or fissures occur in rock trenches.

**Hold Point** - Do not place backfill against any in‑situ concrete structure until the concrete has attained 80% characteristic strength and approval has been given.

CULVERTS UNDER WATER RETAINING EMBANKMENT

Backfill culverts penetrating the water retaining embankment as shown on the Drawings.

CULVERTS ELSEWHERE

Place backfill in layers not exceeding 150mm compacted thickness.

Ensure the maximum difference in height of backfill on each side of a culvert is 300mm.

Backfill around the culvert for the full width of the trench, and for a minimum 300mm 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% MMDD.

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.

Carry out conformance testing using the Departments Panel Period Contractors for Testing.

Stabilise top 150mm of backfill, for a distance of 1m 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% MMDD.

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% MMDD.

## Inlet And Outlet Structures And Maintenance Holes – witness point

Construct in accordance with the specifications.

Compact foundations to 95% MMDD to a depth of 150mm minimum.

Replace unsuitable material as specified in the EXCAVATION Clause.

Clean out new work and existing work affected by the new work.

**Witness Point**  - Advise the Superintendent within 2 days of when cleaning out is completed.

## 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 150mm 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.

## 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% MMDD.

Allow natural surface runoff.

Fill existing open drains crossing under the line of the water retaining embankment as shown on the Drawings.

## Removal Of Existing Culverts And Drainage Structures

Demolish and remove from the site, as specified, existing culverts and drainage structures.

## 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.

# Protection Works

## 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 1141.25.1 Degradation factor – Source rock (Washington Degradation Test).

AS 1141.26 Secondary minerals content in basic igneous rocks

AS 1141.29 Accelerated soundness index by reflux. Basic igneous rocks

AS 1289 Methods of Testing Soils for Engineering Purposes.

AS 1725 Galvanized Rail‑less Chain wire Security Fences and Gates.

AS 2001.2.3.2 Methods of test for textiles - Method 2.3.2: Physical tests - Determination of maximum force using the grab method (ISO 13934-2:1999, MOD)

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.

NTMTM NT Materials Testing Manual.

NTTM NT Test Methods

## 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% maximum dry density ratio (modified).

## Geotextile FabricS

### General

Supply and lay non‑woven polypropylene or polyester geotextile fabric, consisting of long chain synthetic polymers composed of at least 95% by mass of polyolefins or polyesters. The geotextile filaments must be rot-proof, chemically stable and must have low water absorbency. Filaments must resist delamination and maintain their dimensional stability in the geotextile.

Non-woven geotextiles must have filaments bonded by needle punching, heat or chemical bonding processes.

Woven geotextiles must have filaments interlaced in two sets, mutually at right angles. One set must be parallel to the longitudinal direction of the geotextile.

Geotextiles must be free of any flaws which may have an adverse affect on the physical and mechanical properties of the geotextile.

Geotextiles must be stabilised against ultra-violet radiation such that, when tested in accordance with AS 3706.11, must have a retained strength of at least 50% after 500hours of exposure.

### Storage, Packaging and Handling

Geotextiles must be stored under protective cover or wrapped with a waterproof, opaque UV protective sheeting to avoid damage prior to installation.

Geotextiles must not be stored directly on the ground or in any manner in which they may be affected adversely by heat, water or soil. The method of storage must be in accordance with recommendations by the manufacturer.

The protected geotextile rolls must be clearly labelled showing manufacturer, type of geotextile, and batch identification number.

Handle rolls with forklifts or similar, using dedicated slings, free of sharp hooks or tongs. Rolls that are dropped, dragged or pushed around on the ground will be rejected.

### Delivery and Product Certification

Geotextile must be delivered to site at least 5 days prior to commencement of installation.

Provide a Certificate of Compliance that the geotextile complies with all the requirements as specified, together with test results reported on NATA endorsed test documents. The certificate must not be more than 12 months old.

The Certificate of Compliance to include: quality control documentation for the relevant batch/lots, physical properties sheet, and manufacturer’s letter of certification stating compliance.

### Construction

Prepare smooth surfaces for placement of the geotextile, free of sharp objects, large rocks and protruding vegetation.

Place geotextiles just ahead of the advancing face of construction work, with a maximum of 48 hours of placement prior to covering.

Repair punctures and tears.

Where used in trenches or other drainage configurations, place the geotextile to the shape of the prepared surface, folding and overlapping where required. Fully envelope drainage materials in trenches.

Unless specified elsewhere in the contract, the overlap must be minimum 300mm. Overlap to be minimum 500mm where large ground deformations are expected. Sewing may be permitted provided the seam strength exceeds the parent material grab strength.

Direct travel of machinery over geotextile not permitted.

Where required, conform to the following initial layer of material thicknesses:

|  |  |
| --- | --- |
| **Table - Minimum Initial Layer Thickness (mm)** | |
| **Nominal Maximum Particle Size D85 of Initial Fill Layer (mm)** | **Minimum Initial Layer Thickness (mm)** |
| < 150 | 300 |
| 150 - 300 | 400 |
| 300 - 500 | 500 |

Rock armour placed directly on geotextiles must be placed with a drop height of less than 1.5m, and placed in a such a manner so as not to damage, puncture or tear the geotextile.

Obtain Superintendent approval for use of vibratory compaction methods on the initial layer.

### Geotextile Grades

Unless specified elsewhere in the contract, use: non-woven, Strength Grade B.

All strength grades, where specified, based on a Characteristic Values (Q), to conform to the Table - Geotextile Strength Grade Properties

| **Table – Geotextile Strength Grade Properties** | | | | |
| --- | --- | --- | --- | --- |
| **Geotextile Strength Grade** | **Elongation (1)** | **Grade Strength (2) (N)** | **Tear (2) (N)** | **G Rating (2)** |
| **A** | >30%  <30% | 500  800 | 180  300 | 900  1350 |
| **B** | >30%  <30% | 700  1100 | 250  400 | 1350  2000 |
| **C** | >30%  <30% | 900  1400 | 350  500 | 2000  3000 |
| **D** | >30%  <30% | 1200  1900 | 450  700 | 3000  4500 |
| **E** | >30% | 1600 | 650 | 4500 |
| Notes:   1. % Elongation corresponding to max CBR burst strength as per AS 3706.4. Generally <30% for wovens, >30% for non-wovens. 2. Property value is 80th percentile characteristic value (mean strength – 0.83 x standard deviation), as per relevant AS test. | | | | |

Filtration properties relevant to each grade to be certified as part of PRODUCT CERTIFICATION clause requirements.

### Conformance Testing

Where project requirement is less than 15,000m2, sampling and testing is not required.

Provide samples to independent, NATA accredited testing laboratory when project exceeds 15,000m2, to the following test frequencies:

|  |  |  |  |
| --- | --- | --- | --- |
| **Table – Test Frequencies** | | | |
| **Description** | **Units** | **Test Method** | **Test Frequency** |
| Tensile Strength | kN/m | AS 3706.2 | 1 per 15,000 m2 |
| Tear Strength | N | AS 3706.3 | 1 per 15,000 m2 |
| CBR Burst Strength | N | AS 3706.4 | 1 per 15,000 m2 |
| Grade Tensile Strength | N | AS 2001.2.3.2 | 1 per 15,000 m2 |
| Flow Rate | l/m2/s | AS 3706.9 | 1 per 90,000 m2 |

Samples to be 15m2 in size, cut across full width of the roll, not within 2m of the end of a roll.

## 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;

1. Stone Pitching
2. Dumped Rock
3. Quarter Tonne Dumped Rock
4. Rubble
5. Gabion Rock
6. Reno Mattresses

REQUIREMENTS; Clean, dry, durable crushed stone of uniform quality, free from 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, e.g. 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.

## Stone Pitching

### 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.

### Grouted Stone Pitching – Hold Point

Place stones as specified in the Stone Pitching Clause.

**Hold point** - 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.

## Dumped Rock Protection

Large spalls or boulders complying with the Rock Properties clause and having a least dimension of >100 mm.

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.

## Quarter Tonne Class Dumped Rock Protection

Large spalls or boulders complying with the Rock Properties clause and having the following grading.

|  |  |
| --- | --- |
| **Table – Rock - Size and grading** | |
| **Rock Size** | **Minimum % Larger Than** |
| 35kg | 90 |
| 250kg | 50 |
| 500kg | 0 |

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.

## 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.

## Gabions

### 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.

### 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.

Conform to the following wire sizes and galvanizing weights:

### Table - Wire Properties, Gabions

|  |  |
| --- | --- |
| **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.

### 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.

## Reno Mattresses

### 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.

### 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.

Conform with the following wire sizes and galvanizing weights:

### Table - Wire Properties, Reno Mattresses

|  |  |
| --- | --- |
| **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.

### 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.

## Revetment Mattresses

### General

A nylon fabric material filled with mortar with filter points for the relief of hydrostatic uplift pressure.

Conform to the manufacturer's instructions.

### Materials

Mortar mix proportions:

|  |  |  |  |
| --- | --- | --- | --- |
| **Table – Mortar Mix Proportions – Revetment Mattresses** | | | |
| **Cement Type GP or GB** | **Fine Sand** | **Coarse Sand** | **Water** |
| 1 (500 kg) | 1.2 (600 kg) | 2.2 (1,100 kg) | 450 l/m3 |

Adjust fine sand/coarse sand proportions if required to provide workable mix.

### 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 m2 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.

## 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.

## Turf reinforcement Mat

### General

A non-biodegradable geotextile to stabilise soil and encourage and support vegetation growth. Supply, store, handle and install in accordance with manufacturers recommendations.

### Materials

Propex LANDLOK 450 or equivalent.

### Construction

Install in accordance with manufacturer’s details at the locations and layouts shown on the Drawings taking into account manufacturer’s recommendations on anchor pin spacing, overlapping, breaks in slope, terminal channel trenches and so on.

# Road Furniture And Traffic Control Devices

## Standards

Conform to the following Standards and Publication unless specified otherwise:

AS 1012 Set Methods of testing concrete

AS 1074 Steel tubes and tubulars for ordinary services

AS/NZS 1111 ISO metric hexagon commercial bolts and screws (Set)

AS/NZS 1112 ISO metric hexagon nuts, Including thin nuts, slotted nuts and castle nuts Set

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 Set Structural steel welding

AS/NZS 1594 Hot rolled steel flat products

AS 1604.1 Specification for preservative treatment – Sawn and round timber

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 Set 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/NZS 1906.1 Retroreflective sheeting

AS 2423 Coated steel wire fencing products for terrestrial, aquatic and general use

AS 2700 Colour standards for general purposes

AS/NZS 3845.1 Road safety barrier systems and devices - Road safety barrier systems

AS/NZS 4680 Hot dip galvanized (zinc) coatings on fabricated ferrous articles

APAS 1441/1 Permanent graffiti barrier, clear, exterior

APAS 1442/1 Temporary graffiti barrier, clear, exterior

APAS 1443 Graffiti Remover

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## Definitions

CS or C(S) Civil Standard drawing. Use the most recent version.

GRAFFITI: The name for images or lettering scratched, scrawled, painted or marked in any manner on property.

LONGITUDINAL LINES: Any line which runs parallel to the road centre line, e.g. broken line, edge line, separation line, barrier line.

OTHER MARKINGS: All diagonal lines, chevron markings and messages on the pavement, including symbols, words, numerals, arrows and kerb markings.

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.

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

## Fencing

### 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.

### 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.

### 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.

### Stock Fence

Stock fencing to consist of tubular steel strainer assemblies with star pickets and galvanized wire. Construct as specified on standard drawing CS 1306.

Include the crossing of gullies, watercourses and hollows on the ground.

### 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 on standard drawing CS 1303.

### Pedestrian Safety Fence

Safety fence to consist of "HUMEARC" type SWP HRI x 3m panels or similar.

Erect the fence in accordance with manufacturer's specifications.

### Log Barrier Fence

Provide log barrier fencing consisting of close spaced vertical bollards.

Use recycled plastic bollards or 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.

## Guide Posts

### Posts

Use THERMOPLASTIC guide posts manufactured from plastic alloy ASA/PC or similar.

Refer to standard drawing CS 1300-1.

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.

### Certification of Guide Posts – Hold Point

Hold Point - Provide certification that guide posts conform to the following:

1. 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.
2. 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.
3. The guide post material has a minimum vicat softening point of 120 °C.
4. Physical testing as specified.
5. Resistant to termites.

### Guide Post Characteristics – Hold Point

Provide guide posts which have the following:

1. An anti‑withdrawal device which will prevent the guide post from being withdrawn without dislodgement of the compacted backfill.
2. 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.
3. Legible and indelible marking 380 mm from the bottom of the guide post, to indicate depth for installation.
4. **Hold point -** Provide a sample guide post from each batch purchased for this contract for approval before installing any guide posts.
5. 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.

### 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.

## Road Signs – HOLD POINT

### General

This subsection specifies the manufacture, supply, delivery and erection of road signs.

### Materials – Hold Point

NON‑REFLECTIVE MATERIALS

In accordance with AS 1743.

REFLECTIVE MATERIAL

Use high intensity Class 1 standard in accordance with AS 1906.1 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 5052 ‑ 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 DIPL 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. Do not use “Ingal” posts.

Standard; to AS 1074.

Anti-graffiti coating

**Hold Point –** Obtain Superintendent’s approval for the use of anti-graffiti film or coating products. Apply anti-graffiti products only to the new road signs specified by the Superintendent.

### Supply and Delivery

Supply all brackets, bolts, nuts and bracings.

Fix bracings to the signs prior to delivery.

### 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:

|  |  |
| --- | --- |
| **Table – Heights for signs** | |
| **Unkerbed Roads** | |
| Fingerboard (G3) and  street name signs (G5): | 2 m above the near edge of the pavement. |
| Other signs: | 1 m to 1.5 m above the near edge of the pavement. |
| **Kerbed Roads:** | |
| 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. |

|  |
| --- |
| **Table – Height of 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). |

### Installation

Conform to the Table Roadside Signs - Mounting Selection.

Install posts vertically.

Provide and install a galvanised steel sleeve when installing sign posts in concreted or paved medians.

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.

### Roadside Signs – Mounting Selection

| **Table – Roadside Signs – Mounting Selection** | | | | | |
| --- | --- | --- | --- | --- | --- |
| **Sign Size**  **W x D** | **No. and NB Gal. Pipe Posts** | **Sign Attachment Brackets (Or M8 Bolts) Per Post** | **Bracing** | **Anchor** | |
| **Depth (mm)** | **Depth (mm)** |
| 300 x 300 | 1 x 50 | 2 | No | 600 | 300 |
| 300 x 450 | " | " | " | " | " |
| 450 x 450 | " | " | " | " | " |
| 450 x 300 | " | " | " | " | " |
| 450 x 600 | " | " | " | " | " |
| 450 x 750 | " | " | " | " | " |
| 450 x 900 | " | " | " | " | " |
| 600 x 450 | " | " | " | " | " |
| 600 x 600 | " | " | " | " | " |
| 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 | " | 2 | Yes | 600 | " |
| 900 x 600 | " | 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 | " | 600 | " |
| 1800 x 600 | 2 x 50 | 2 | " | 1000 | " |
| 1800 x 1200 | 2 x 80 | 4 | " | " | " |
| 2400 x 1200 | 2 x 80 | 4 | " | 1200 | 450 |
| 2400 x 1800 | 2 x 100 | 5 | " | " | " |
| 3000 x 600 | 2 x 50 | 2 | " | 1000 | 300 |
| 3000 x 1200 | 2 x 80 | 4 | " | 1200 | 450 |
| 3000 x 1800 | 2 x 100 | 5 | " | 1500 | " |
| 3700 x 600 | 2 x 80 | 2 | " | 1000 | 300 |
| 3700 x 1200 | 3 x 80 | 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 | " |

### 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.

GENERAL REQUIREMENTS

1. Spacing between posts:

- 2 post signs ‑ 0.6 times sign width.

- 3 post signs ‑ 0.4 times sign width.

- 4 post signs ‑ 0.3 times sign width.

1. Brace spacing to be 380 mm maximum.
2. Adopt the nearest size in the list for intermediate sizes.
3. 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.
4. 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 ROADSIDE SIGNS - MOUNTING SELECTION.

## FLOOD ADVISORY SIGNS

Erect standalone flood advisory signs within the detention basin at locations shown and in accordance with the Drawings. Erect in accordance with ROAD SIGNS.

Position advisory signs so they face away from high ground and can be read from within the detention basin.

## Flood Gauge Posts

### Posts and Gauges

Use a standard flood gauge in accordance with Standard Drawing CS 1301.

Use galvanized posts, single length 150 mm x 50 mm x 3 mm RHS with a 3 mm end cap welded to the top.

Paint welds with zinc rich organic paint to APAS specification 2916.

### 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 650 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 No 10 galvanized Tek screws or 4 mm blind pop rivets at 300 mm centres staggered alternately each side.

Position gauge zero to comply with lowest spot on floodway along the centre line.

## Steel Beam Guardrail

### Materials

RAILS

Use W‑beam guardrail to AS/NZS 3845.1 of nominal 300 mm width formed from HA 350 steel to AS/NZS 1594.

Rails to be capable of withstanding a cold bend of 180 deg. around a diameter 2.5 times its own thickness without cracking.

Base 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 drawings.

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.

Where the galvanising on guard rail or associated fittings has been damaged, the coating shall be repaired by regalvanising or by painting with a minimum of two coats of a zinc‑rich inorganic paint in accordance with AS/NZS 3750.9 and one coat of aluminium paint.

COMPLIANCE

**Marking of materials - AS/NZS 1594**

Each coil or shipping unit shall be clearly and durably marked or tagged to indicate the following:

(a) Steel grade designation.

(b) Dimensions.

(c) Name or registered trade name or mark of the manufacturer.

(d) Batch identification.

If the marked portion of the material is subsequently removed then these markings are to be transferred to each remaining portion of the material.

**Traceability of components - AS/NZS 3845 Part 1**

(a) All steel rails, posts and other critical components shall be permanently marked in lettering at least 10 mm high with the name of System Manufacturer, the date and month of manufacture the grade of steel and base metal thickness (BMT) to allow the product to be traced.

(b) Where plastic components make up a key element of the system, they shall be permanently marked clearly indicating the month and year of manufacture in a location that can be easily inspected.

(c) Bolts shall be marked in accordance with AS 1111.1 or AS/NZS 1252.

**Certificate(s) of compliance - AS/NZS 1594**

Provide certificate(s) of compliance from the manufacturer that the steel used in the manufacture of the steel beam guardrails is of structural grade HA 350.

**Certificate(s) of compliance - AS 4680**

Provide certificate(s) of compliance from the galvanizer that the galvanizing complies with AS 4680.

### 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.

### Demolition

Remove and dispose of existing steel beam guard rail on the western side of Henry Wrigley Drive opposite Abala Drive and across Drain 2.

# Pavement Marking

## 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.

## Standards

Conform to the following Standards and Publication unless specified otherwise:

AS/NZS 1580 Set Paints and related materials - Methods of test

AS/NZS 1580.205.4 - Application properties - Airless spraying

AS 1742 Set Manual of uniform traffic control devices

AS 1744 Standard alphabets for road signsAS/NZS 1906 Retroreflective materials and devices for road traffic control purposes

AS/NZS 1906.1 Retroreflective sheeting

AS/NZS 2009 Glass beads for road marking materials

AS/NZS 2310 Glossary of paint and painting terms

AS/NZS 2311 Set Guide to the painting of building

AS/NZS 2433 Plastics - Method for exposure to ultraviolet lamps

AS 2700 Colour standards for general purposes

AS 3730 Set Guide to properties of paints for buildings

AS/NZS 3750.22 Paints for steel structures – Full gloss enamel – Solvent-borne

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 surface applied glass beads

APAS 0041/4 Road marking paint, thermoplastic

APAS 0041/5 Road marking paint, water borne

APAS 0042 Glass beads for pavement marking paint

NTMTM NT Materials Testing Manual

NTTM NT Test Methods

## Definitions

ATLM Audio Tactile Line Marking.

APSA Australian Paint Approvals Scheme.

CS & C(S) Civil Standard drawings. Use the most recent version.

LONGLIFE MATERIALS Generally thermoplastic, cold applied plastic or pliant polymer materials, with lifespans between 2 to 5 times that of waterborne paint.

LONGITUDINAL LINES: Any line which runs parallel to the road centre line, e.g. broken line, edge line, separation line, barrier line.

NTTM NT Test Methods, found in NT Materials Testing Manual.

OTHER MARKINGS: All diagonal lines, chevron markings and messages on the pavement, including symbols, words, numerals, arrows and kerb markings.

PCCP Painting Contractors Certification Program.

RETROREFLECTIVITY The reflectivity provided by glass beads expressed as minicandela per lux per square metre (mcd/lux/m2) as measured by a reflectometer approved by the Superintendent.

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.

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.

## Contractor Accreditation

All pavement marking work must be carried out by a contractor accredited to the “Painting Contractor Certification Program” (PCCP) in a class or category applicable to the work. The PCCP is administered by the CSIRO. Information regarding the PCCP can be obtained at [*http://www.apas.gov.au/pccp/*](http://www.apas.gov.au/pccp/)*.*

## Road Marking Paint – Witness Point

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.

**Witness Point** - Submit a 'Certificate of Compliance' of the paint with the relevant Australian Standards or APAS specification.

## Thermoplastic Materials

Thermoplastic road marking material must consist of aggregate, pigment, binder, glass beads and extenders, capable of being softened by heating and hardened by cooling.

Thermoplastic road marking materials must comply with AS 4049.2.

### Audio Tactile Markings

Thermoplastic used for audio tactile pavement markings must comply with AS 4049.2 but modified as follows:

1. Softening Point: When determined in accordance with AS2341.18 the softening point shall be not less than 95° C.
2. Cold Flow: When determined in accordance with AS 4049.2:2005 Appendix I – Determination of flow resistance - the cold flow shall be no more than 5% at 40° C.
3. Skid Resistance: When tested in accordance with AS 4049.2:2005 Appendix K – Field tests for thermoplastic pavement marking material – and Appendix L – Field determination of skid resistance (wet pendulum method) - at any time up to 3,000,000 vehicle passes, the skid resistance value of beaded unprofiled base material must be not less than 50.
4. Retro-reflectivity: Mix glass beads in accordance with AS 2009 Type C into the thermoplastic material at a rate of not less than 30% by mass prior to application.

### Cold Applied Thermoplastic Materials – Witness Point

### Standards

AS 4049.2 Paints and related materials—Pavement marking materials - Part 2: Thermoplastic pavement marking materials—For use with surface applied glass beads

AS 4049.4 Paints and related materials—Pavement marking materials – Part 4: High performance pavement marking systems

AP-S0041/3 Pavement marking materials – cold applied plastic

AP-S0042 Glass beads for use in pavement marking paints

### Materials – Witness Point

Generally: A two part Poly Methyl Methacrylate resin based pavement marking material that complies with the requirements for colour, luminance and bead content of AS 4049.2, and which complies with AS 4049.4, sprayed or screeded onto the pavement, containing pre-mixed glass beads, with additional drop-on beads being added during application, conforming with the following requirements of AS 4049.2: Clause 5.1 – Colour, Clause 5.2 - Luminance and Clause 7 - Field Testing. The material shall have a maximum no-pick-up time of 60 minutes.

**Witness Point** - Provide evidence that all proprietary products such as epoxy or plastic products have demonstrated satisfactory field performance for a period of at least three (3) years.

### Application – Witness Point

Application is to be in accordance with the Manufacturer’s Specification.

**Witness Point -** Provide evidence that it has been applied in accordance with the Manufacturer’s instructions.

The area to be marked is to be dry and free of dirt, gravel, oil and other loose or foreign material to ensure the best possible adhesion of new material. Remove existing paint or other material which is flaking or chipped. Cleaning may be carried out by brooming, blowing or washing.

Use a tack coat or primer material for surface or other conditions requiring it in accordance with the Manufacturer’s Specification.

Apply by spraying, screeding, trowelling or extrusion methods, including application of glass beads and anti-skid material, in a single uniform layer.

For longitudinal lines and transverse markings, apply material at a rate to achieve a minimum final thickness of 2.5 mm ± 0.5 mm for application by screeding, trowelling or extrusion methods. Glass beads are to be Class C (intermix 20 to 30 % by mass) and Class D. As well as the “mixed in” glass beads additional Class D beads shall be uniformly applied to the surface of thermoplastic at the rate of 0.40 kg/m2 as part of the application process and before the material has commenced to set.

The marking produced shall be uniform in texture, width and thickness and the surface substantially free from blisters, streaks, lumps and other defects.

Remove any occurrence of overspray and gun dribble.

### Setting out

The location of all pavement markings on new surfaces, including reflective raised pavement markers, shall be set out by spotting with paint or other approved method prior to application of the markings.

The location of all pavement markings over existing markings shall match the existing except where directed otherwise.

For continuous thermoplastic pavement marking, 50 mm drainage gaps shall be provided, at a maximum spacing of 6m +1m, to allow adequate drainage of the pavement surface. Nominate in the Contract Management Plan the method of identifying the location and spacing for these gaps.

## Glass Beads – Witness Point

Use Intermix glass beads conforming to AS/NZS 2009 and APAS specification 0042 with the exception of size, and conforming to the following size distribution requirements:

|  |  |  |
| --- | --- | --- |
| **Table – Glass Beads Size Distribution** | | |
| **Sieve Size (Microns)** | **% Retained** | **% Passing** |
| 1180 | 0 – 3 | 97 – 100 |
| 850 | 5 – 20 | 80 - 95 |
| 425 | 65 – 95 | 5 – 35 |
| Pan | 010 | - |

**Witness Point** - Submit a 'Certificate of Compliance' of the glass beads with the relevant Australian Standard and APAS specification.

## Setting Out

New work: Set out line marking to the line pattern specified in accordance with the Standard Drawing for Line Marking, CS 1520-4 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.

## Application – Witness Point

**Equipment**: Apply the marking materials using a self‑propelled mobile sprayer, hand sprayer, hand painting or hand screeding as directed by the Superintendent.

**Witness Point** - Obtain approval from the Superintendent for the type of equipment to be used for applying pavement marking materials.

**Witness Point** - Produce documented evidence to show that the spraying equipment has been calibrated in accordance with NTTM 405.1.

Maximum application speed for Intermix glass beads is 12 Km/h.

Apply glass beads by low pressure or delivered by gravity dispenser.

The application rates specified for glass beads are the amounts that are 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 – Road Markings

|  |  |  |
| --- | --- | --- |
| **Table – Application Rates – Road Markings** | | |
| **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/m2 | Intermix glass beads  > 300g/m2 |
| 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/m2 | Intermix glass beads  > 300g/m2 |

## 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. Ensure that the loss in glass beads after three weeks traffic does 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.

## 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.

## Workmanship – Hold Point

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.

**Hold Point** - 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.

## 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 (NTTM 401.1).

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 (NTTM 402.1).

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 AS 4049.3:2005 Appendix K, Method A, Photographic Method.

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.

## Resealing Contracts

Conform to the requirements set out in this section and to the following requirements for resealing work including enrichments, spray sealing, rejuvenation and emulsion coats.

Conform to the requirements of the PAVEMENT MARKING clauses.

### Panel Contractors

The Principal has in place a Panel Contract with approved line marking companies.

The selection of the Panel Contractors for particular contracts is made on a rotating basis and the Superintendent will advise of the name and contact details of the Panel Contractor to be used on this contract.

The Principal will pay the Panel Contractor direct for the pavement marking work.

### 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 Panel 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.

## aUDIO TACTILE LINE MARKING (ATLM)

### Site Preparation

Immediately prior to marking application, remove all extraneous or loose material from areas where the thermoplastic material is to be applied. Prepare and prime areas as recommended by the manufacturer to ensure satisfactory adhesion of thermoplastic material.

### Application

Apply ATLM directly on to the road surface on existing painted edge lines or centre double barrier lines.

Apply markings within the tolerances specified in Table – Audio Tactile Marking Tolerances. The height of the thermoplastic raised ribs is measured from the planed surface formed by the tops of the aggregate.

### Table – Audio Tactile Line Marking Tolerances

|  |  |  |
| --- | --- | --- |
| **Table - Audio Tactile Line Marking Tolerances** | | |
| **Aspect** | **Dimension** | **Tolerance (mm)** |
| Height of raised rib | 8mm | +2mm or -1mm |
| Spacing of raised rib | 250mm | ± 10mm |
| Length of raised rib | 50mm | ± 2mm |
| Slope of raised rib | 45 degrees | ± 10 degrees |
| Width of raised rib (edge line). | As shown on project drawings. Otherwise 100mm | ± 2mm |
| Width of raised rib (centre barrier line) | 80mm | ± 2mm |

### Retro-reflectivity

Apply glass beads in accordance with AS 2009 Type B immediately to the surface of the molten thermoplastic material. The minimum rate to be retained on the thermoplastic material is 200g/ m2.

When tested in accordance with AS 4049.2:2005 Appendix K - Field tests for thermoplastic pavement marking material – and Appendix M – Determination of retroreflectivity , marking must achieve a minimum level of reflectivity of 350 mcd/lux/m2 at time of application.

## Raised Retroreflective Pavement Markers (Rrpms)

### 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.

### 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.

### 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.

Ensure that the surface finish is 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.

For reseal works where the existing seal has excess binder, or where Gilsabind is used:

* Clean the road surface to expose the aggregate prior to installation of RRPMs.
* Protect the RRPMs from traffic until the adhesive is fully set.
* Locate the RRPMs to the outside of edge lines.

## Removal of Existing Markings – Hold Point

**Hold Point –** Obtain approval from the Superintendent on the method used for line marking removal.

Removal of pavement marking must not adversely affect the integrity of the road surface.

When arrows, letters or figures are to be removed or temporarily blacked out, the removal pattern must be in the shape of a rectangle or square to minimise confusion to the motorist, particularly in wet weather or poor lighting conditions.

Remove all materials and debris from removal operations and dispose at an authorised disposal site. Repair any surface defect caused by the removal process at no additional cost to the Principal.

The following methods may be considered and will be dependent on the type of surface, extent and application.

### Machine Grinding

This method may be considered for use on smaller removal jobs where surface finish is not a concern. Can be used on most asphalt and concrete surfaces.

### Sandblasting

Sandblasting is the preferred method for marking removal on asphalt and concrete surfaces.

Use a skirt or guard around the blaster to minimise the spraying of material away from the immediate work area.

Remove waste material before it can be transported by rain, wind or traffic. This will generally require the use of a vacuum attachment operating concurrently with the blasting operation or alternative method approved by the Superintendent in the Standard Specification for Road Maintenance.

### Sealing

Spray sealing is the preferred method for sprayed seal surfaces. Conform to specification requirements covered under the SPRAY SEALING FOR MAINTENANCE section.

### Paint Blackout

Paint blackout may be considered as a temporary measure only as markings retain a high reflection and possess low skid resistance.

### Other Methods

Other methods such as water blasting, heat lance or paint stripping may also be considered by the Superintendent.

### Raised Reflective Pavement Marker Removal

Where required, remove raised pavement markers by breaking the bond between the adhesive, the road surface and the base of the raised pavement marker.

Repair all divots caused by the removal of raised pavement markers with hot melt adhesive or epoxy adhesive to the level of the surrounding pavement.

# Landscape

## Standards

Conform to the following Publications unless specified otherwise:

AS/NZS 3500 Plumbing and drainage

AS 4419 Soils for landscaping and garden use.

**Specification Reference**

Refer to the Northern Territory Government Standard Specification for Environmental Management.

**Landscape Defects Liability Period**

The defects liability period for the Landscaping portion of the works is 16 weeks from practical completion.

## Definitions

CERTIFIED SEED: Seed by record of origin, purity, and strain and conforming in character to the parent stock.

EXOTIC PLANTS: Any plants not native to Australia.

FINE TILTH: The friable soil resulting from cultivation.

GERMINATION PERCENTAGE: The proportion of pure seed germinating in a fixed time under standard laboratory conditions.

MULCH: Stable material spread as a surface treatment to reduce soil erosion, water loss, and weed invasion.

NATIVE PLANTS: Plants that are natural to Australia.

NPK RATIO: The ratio of Nitrogen (N), Phosphorus (P), and Potassium (K) in a fertiliser compound.

ROOT BALL: The finely bound fibrous root and soil removed intact from the container with the plant.

SHALL: The term ‘shall’ is indicative of a mandatory requirement unless the context clearly indicates otherwise.

SOIL BINDING AGENT: Material which stabilises and conditions soil and aids moisture retention.

## Materials

### Trees, Shrubs and Ground Covers

Provide trees, shrubs and ground covers which have the following characteristics:

1. Trunks/stems to be sturdy and well hardened.
2. A well developed vigorous root system.
3. A minimum of three months in their container.
4. Be sound, healthy, vigorous, and free from insect pests, plant diseases, sun scalds, fresh abrasions of the bark, or other disfigurements.

### Grass

Seed shall be covered by an appropriately numbered seed analysis report or certificate cross referenced to the number on the seed sacks.

Seed shall be used only if its report or certificate has been issued within the previous six months.

Seed used shall be true to label.

Seed shall have minimum germination of 80%.

Seed shall comply with the following purity characteristics:

1. Clean seed, minimum 94% by weight.
2. Weed seed, maximum 0.2% by weight.
3. Other crop seed, maximum 0.8% by weight.
4. Inert matter, maximum 5.0% by weight.
5. Shall not contain any Hyptis Sauveolens, Sida Acuta, Sida Cordifolia.

Seed mixes shall conform to the Table Seed Mixes.

| **Table – Seed Mixes** | | | | |
| --- | --- | --- | --- | --- |
| **Water Regime** | **General Latitude** | **Seed Type** | **Percentage By Weight** | **Mixture Application Rate** |
| Irrigated areas | All | Cynadon dactylon  (Couch) | 30 | Minimum 100 kg per hectare |
| Paspalum notatum pensicola | 35 |
| Paspalum notatum argentina | 35 |
| Dry grassland areas | North of Adelaide River | Paspalum notatum pensicola | 20 | Minimum 300 kg per hectare |
| Paspalum notatum argentina | 80 |
| Adelaide River to Katherine | Paspalum notatum pensicola | 20 | Minimum 50 kg per hectare |
| Bothriochloa petusa | 10 |
| Cynadon dactylon | 20 |
| Chloris Gayana | 30 |
| Urochloa mosambicensis  (Sabi Grass) | 20 |
| Katherine to Mataranka | Paspalum notatum pensicola | 20 | Minimum 50 kg per hectare |
| Bothriochloa petusa | 10 |
| Chloris Gayana | 30 |
| Urochloa mosambicensis  (Sabi Grass) | 20 |
| Urochloa mosambicensis | 20 |
| Cenchus Setiger  (Birdwood Grass) | 20 |

### Fertiliser

Fertilisers shall be stored in waterproof sealed bags under shelter away from water and direct sunlight.

Fertilisers shall conform to the Table Fertilisers.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table - Fertilisers** | | | |
| **Use** | **General Plant Category** | **Where Used** | **Component Requirements** |
| Planting | Native | Surface | "TROPIGRO Native Plant Feed Mix" or similar |
| Exotic | Surface | "TROPIGRO Exotic Planting and Feeding Mix" or similar |
| Native and/or Exotic | Hole | Granular or Tablet Slow Release (6 month minimum) 20:10:10 NPK ratio |
| Feeding | All existing plants | Surface | As for Planting - Surface |
| Grassing | All seeding, both new and existing | Surface | Fast Release 15:7:7 NPK ratio Trace Elements |
| Do not use fertiliser with Grevillia and Banksia plant varieties. | | | |

### Imported Soils

Imported topsoil shall conform generally to AS 4419 and the following requirements:

1. Be free draining.
2. Be red‑brown or black sandy loam.
3. Contain no grass or weed growth.
4. Maximum stone size of 35 mm.

### Insecticide

Use Fipronil for termite control.

Insecticide shall be used strictly in accordance with the manufacturer’s instructions.

### Mulch

Organic

1. Shall be stable, free from impurity, and be sufficiently heavy to prevent dispersal by wind.
2. Shall be shredded bark, wood chips, hay or similar.
3. Wood chips shall be a maximum size of 50 mm, inert, and shall be free of resinous toxins and termites.

Inorganic

1. Shall be washed and screened lateritic gravel or brick chips with particle sizes in the range 6 mm minimum to 25 mm maximum.

## Site Preparation

### Setting Out

The Contractor shall be responsible for accurately setting out the works in accordance with the drawings.

In particular, trees shall not be planted:

1. Within a distance of 1.5 × ultimate tree or shrub height from the toe of the water retaining embankment
2. Within 8.0 m of the edge of the carriageway of Henry Wrigley Drive
3. within 30 m of the end of a central median for trees, or 10 m for shrubs;
4. within 5 m of a road light pole;
5. within 1.5 m of a fire hydrant; or
6. where their location will ultimately obscure traffic signs, signals, or other essential roadside features.

### Protection of Existing Vegetation

Ensure all trees, shrubs, and other vegetation to be retained within the limits of work are not damaged, and the conditions hereunder are conformed to.

Protect vegetation prior to commencing construction work in the vicinity of that vegetation.

Do not place or dump any chemical type materials including oil, paint, bituminous products, fuels, and cement/concrete near the vegetation - even for short periods. Prevent windblown chemical type materials, such as cement, from affecting vegetation.

Do not stockpile bulk materials - such as spoil from excavation, boulders, cleared vegetation - under or near vegetation. Ensure such spoil is never placed against trunks, even for short periods.

Do not remove topsoil from within the dripline (i.e. canopy area) of vegetation unless essential to the works. For any excavation within the dripline keep open as short a period as possible, and use excavation methods that preserve the root system intact and undamaged.

Cut roots only where it is absolutely necessary. When cutting roots use a means which does not disturb the remaining root system.

Backfill excavation around tree roots with material of at least comparable quality to that excavated. Consolidate backfill and do not backfill around trunks above the original level. Thoroughly water backfilling.

Avoid damage to overhead limbs by machinery. Only remove the minimum amount required if limbs must be removed to allow machinery to work.

Where branches are to be removed, cut them back to the branch collar.

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

Trees (including palms and cycads)

1. Valuation rate of $10 per centimetre of trunk circumference at a height of 1 metre above the ground level, within the following limits:

Minimum valuation: $250 per tree.

Maximum valuation: $2,500 per tree.

Shrubs - Valuation rate of $8 per centimetre of trunk circumference at a height of 1 metre above the ground level.

### Earthworks

Remove from site all unwanted vegetation. Backfill and regrade over areas where trees have been removed.

Regrade all areas of excavation to ensure all finished surface levels are free draining.

Excavate or fill to lines and levels shown on the drawings.

Fill placed on areas to be landscaped shall be free from inorganic, deleterious material and stones greater than 100 mm nominal size.

Compact fill sufficiently to ensure initial settlement and provide a firm base.

Clear all subgrade surfaces of stones exceeding 100 mm diameter and rubbish, weeds and roots.

No excavation shall be allowed within 1.5 m of the canopy area of an existing tree.

### Topsoil

Excavate and stockpile material which is suitable for reuse as topsoil.

Imported topsoil shall be as specified in IMPORTED SOILS.

Stockpile topsoil in a free draining area in stockpiles not exceeding 2.0 m in height.

Ensure stockpiles are properly maintained.

## Planting

### Setting Out of Holes – Hold Point

Accurately set out the locations for trees/shrubs to be planted in accordance with the drawings.

Hold point - Obtain approval of the set out from the Superintendent before commencing any planting.

### Preparation and Treatment of Holes

Identify all cable and services locations prior to excavating any holes.

Prepare holes initially in accordance with the Table Initial Hole Preparation Chart appearing below.

Remove excess excavated material, rubbish and cut vegetation from site.

Excavate planting holes by mechanical/manual means.

Size of planting holes shall be twice the diameter and twice the depth of the plant container, unless shown otherwise on the drawings.

Break up glazed sides of holes.

Treat planting holes in hard, dense material prior to planting by

1. placing 1 kg Gypsum or Claybreaker around the sides and bottom of the hole; and
2. filling hole with water and allowing to drain.

Treat holes with Fipronilin accordance with manufacturer's instructions prior to planting.

### Supply of Plants

Place an order with an approved nursery for the supply of all plants required to complete the works within seven days of acceptance of tender.

Ensure that a minimum of five or 5%, whichever is the greater number, additional plants of each species nominated is available if necessary for replacement purposes.

Remove immediately from the site all dead, dying or diseased plants and replace with new plants of the same species.

### Treatment of Plants

Do not use chemicals on site.

Containerised plantings shall be well watered prior to despatch from the nursery and shall remain in the containers until required for planting.

Protect all plants during transportation, against excessive sunlight, wind and drought.

Trees and shrubs which are not immediately planted shall be stood upright on level ground, protected and maintained in good condition by the Contractor.

Replace immediately all plantings which have become damaged, missing or fallen below the specified standard.

Drive any tree stakes required into the ground before planting so as not to damage the root ball.

Check regularly for any termite/insect attack or fungal infestation. Carry out eradication by use of sprayed insecticide or fungicide in accordance with the manufacturer's instruction.

### Planting of Trees, Shrubs and Ground Cover

Planting shall take place only in conditions where temperature range is below 32°C.

Maintain the integrity of the plant root zone and the surrounding earth mould.

Place fertiliser in the hole adjacent to, but not in contact with, the root zone of the plant. Fertiliser shall be in accordance with the table FERTILISERS appearing above. Application rates in accordance with the table FERTILISER APPLICATION RATES appearing below.

Do NOT plant trees or shrubs on the water retaining embankment or within the required clear distance – shown on the Drawings - from the toe of the batters of water retaining embankment.

Do NOT plant trees or shrubs in the clear zone of Henry Wrigley Drive (8.5 m).

### Backfilling

Backfill material shall be in accordance with the Table Initial Hole Preparation Chart appearing below.

Backfill the hole so that the plant is contained firmly in the ground in a vertical position.

Backfill the hole to finish surface level and dish to retain water.

Work surface fertiliser into top 50 mm of backfill. Fertiliser shall be in accordance with Table Fertilisers appearing above. Application rates in accordance with the Table Fertiliser Application Rates appearing below.

Water backfill material immediately after surface fertilisation to ensure no air voids or loose material surround the plant root zone.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table – Initial Hole Preparation Chart** | | | | |
|  | **Land Categories And Soil Characteristics** | | | |
|  | **Marine Sediments** | **Soil And Gravel** (depth greater than 600 mm) | **Shallow Soils** | **Surface Rock** (soil depth overlaying rock less than 600 mm) |
| **Visual appearance** | Grey and brown muds, silts and clays: occasionally pale beach sands | Usually red, yellow and brown sandy loams to sandy clay loams with varying amounts of ironstone gravel; occasionally siltstone and quartz gravel | Soil material similar to Category 2, overlaying laterite on siltstone**\*** | Very little or no soil; extensive areas out of cropping laterite on siltstone**\*** |
|  | | | | |
| **Operational Steps** | | | | |
| **Initial Rock Break** | - | - | - | Rip and rock break. |
| **Initial Excavation** | Hole size dependent upon species and area | Excavate to 600 mm. | Excavate hole till machine rejection (commonly bed rock layer). | Excavate hole to 600 mm minimum. |
| **Secondary Rock Break** | - | - | Rock break bottom to a depth of 1200 mm. | Rock break bottom further 600 mm down. |
| **Secondary** | - | Excavate rocks. | Excavate rocks greater than 150 mm. | Excavate rocks greater than 150 mm. |
| **Excavation Hole Backfilling** | In situ excavated material | If excavated soil has less than 30% gravel, then no additive is required. | Backfill with imported topsoil. | Backfill with imported topsoil. |
| If excavated soil has 30 to 70% gravel, then a 50% mixture with imported topsoil is required. If excavated soil has greater than 70% gravel, then backfill of imported topsoil is required. | NOTE  If existing soil is free draining or humic, then it may be substituted for imported topsoil. | |
| **\*** Laterite - rough textured rock, reddish brown in colour, with orange and yellow mottles (splotches of colour), contains ironstone gravels and pores.  **\*** Siltstones - relatively smooth textured, white, reddish and yellowish layered rock, often with mottles. No ironstone gravel and pores. | | | | |

### Watering and Maintenance

Maintain each planting area in a moist condition to promote healthy growth.

Weed and prune as required to maintain plants in a healthy condition.

### Mulching

Supply mulch as specified that is free from weeds, seeds, sticks, stones, insects, diseases and other deleterious matter.

Provide, where specified, organic mulch in a 100 mm thick compacted layer for a 500 mm radius from the main stem.

Ensure a gap of 50 mm is retained between the main stem and the mulch.

| **Table - Fertiliser Application Rates** | | |
| --- | --- | --- |
| **Plant Type,**  **Use,**  **Planting Method** | **Size of container or plant** | **Application Rate per container or per plant** |
| Native,  Planting  Surface | Tube stock  150 mm container  200 mm container  250 mm container  300 mm container  20 litre bag | 10 g  30 g  80 g  100 g  150 g  300 g |
| Exotic,  Planting,  Surface | Plant height:  0.5 m  1.0 m  2.0 m | 100 g  200 g  300 g |
| Native and/or Exotic,  Planting,  Hole | Ground covers and shrubs 10 cm tall  Ground covers and shrubs 20 cm tall | 10 g  20 g |
| Plants to 1 m  Plants to 2 m  Plants to 3 ‑ 4 m | 40 g  80 g  120 g |
| Advanced trees and palms 2 m -  Advanced trees and palms 3 m -  Advanced trees and palms 4 m - | 200 g  300 g  400 g |
| These rates apply to both granular compound and equivalent products. | |
| Native,  Feeding,  Hole and/or surface | Ground covers:  up to 300 mm wide  300 ‑ 600 mm wide  600 ‑ 900 mm wide  900 ‑ 1000 mm wide  Thereafter | 30 g  50 g  75 g  100 g  100 g per metre |
| Shrubs:  up to 300 mm high/wide  300 ‑ 600 mm high/wide  600 ‑ 900 mm high/wide  900 ‑ 1000 mm high/wide  Thereafter | 50 g  75 g  100 g  150 g  200 g/metre of height or width |
| Trees | 200 g/metre of height |
| Exotic,  Feeding,  Hole and/or surface | Plants | 250 g/metre of plant height |

## Grassing

### Ground Preparation

Bring the area to a fine tilth. Conform to the prescribed finished levels prior to the placement of grass seed.

Remove all stones over 35 mm diameter, debris and deleterious material.

Backfill with topsoil all voids created by the removal of obstructions and deleterious material.

Provide loose depth of topsoil to achieve a minimum topsoil thickness of 100 mm after natural settlement.

Compact the topsoil lightly to minimise subsidence.

Placement and spreading of topsoil shall not take place during periods of heavy rain.

Protect the area to prevent further compacting and trafficking once topsoiling is complete.

Take preventative measures to control erosion and siltation and restore/replace any portion which erodes, silts up or is otherwise damaged.

Apply fertiliser as specified in the Table Fertilisers, at an application rate of 300 kg/hectare minimum, to the finished topsoiled surface and lightly work into the soil. The fertiliser may be applied simultaneously with the grass seed.

### Supply

Supply fresh seeds of the species nominated in the sub-clause Grass in the clause Materials..

### Application

Refer to the Table Fertiliser Application Rates.

Achieve seed mixture application rate as specified in Seed Mixes Table for the following areas as shown in the project drawings.

General Grassed Areas

Apply seed uniformly by mechanical means. Hand distribution shall only be in areas inaccessible to machinery.

Embankments and Cut Batter Grassed Areas

Apply seed uniformly by direct seed sowing and jute mesh matting. Hydro-mulching with Flexterra ‑ HP‑FGM or equivalent may be substituted with Superintendent’s approval.

Turf Reinforced Grassed Areas

Install as per manufacturer’s requirements turf reinforcement matting; Propex Landlok 450 or equivalent.

Apply seed uniformly by direct seed sowing

### Reseeding

Reseed areas that fail to germinate and propagate after 28 days.

Bring areas requiring reseeding to a fine tilth by hand raking only.

Grass seed application to be in accordance with the Table Seed Mixes.

### Irrigation

Water seeded areas as often as is required to keep the ground moist.

### Establishment

Maintain grassed area free of all weeds and insects.

Ensure grass has and maintains complete uniform coverage with active growth.

### Mowing

Mow the grass as follows:

1. First cut when height reaches 150 mm.
2. Further cuts to maintain grass height in range 50 ‑ 100 mm.

## Irrigation – Hold point

### Irrigation System

General

Standard: To AS/NZS 3500.1

Place a high priority on avoiding surface runoff when selecting system components. Use low trajectory sprinklers where possible. Select components to keep the sprinkler precipitation rate below the infiltration rate of the soil and/or use repeat cycles to allow water to soak into the root zones.

Where possible, separate station/zones for irrigation at the top and bottom of sloped areas.

**Materials**

Pipework upstream of control valves: Use uPVC class 12.

Pipework downstream of control valves: Use uPVC class 9 or high density polyethylene.

Performance

Coverage (mm of water over area to be watered): 50 mm per week during the establishment period and then progressively hardening off the local conditions. Ensure that final water usage is such that plant health and vigour is maintained without wastage of water.

**Backflow**

Fit a backflow prevention device; To AS/NZS 3500.1 and as required to meet the approval of PowerWater.

Pressure regulating valves

Provide a pressure regulating valve at the take-off point which is adjustable between 100 and 700 kPa. Install an 800 mm filter sized to suit the flow immediately upstream from the pressure regulating valve, and provide gate valves upstream from the filter and downstream from the pressure regulating valve. Mount the assembly in an accessible position in a valve box or access pit as required.

Irrigation Controller

Use electric solenoid valves wired to an irrigation controller.

In the Darwin Region, the irrigation controller is to be compatible with a “Toro Irrinet” irrigation telemetry system. At the completion of the defects liability period, liaise with the Departments landscape maintenance contractor to have the irrigation system handed over and included into the telemetry control system.

Mount the controller in a weatherproof lockable cabinet. Include the following features:

Variable timer for each station with a range from 1 minute to not less than 30 minutes.

Manual cycle and individual station operation.

Manual on-off operation of irrigation without loss of program.

240 V input and 24 V output capable of operating 2 control valves simultaneously.

24 hour battery program backup.

Power surge protection.

Electrical connection: Connect to a 240 V supply and provide an isolating switch at the controller.

Automatic control valves: 24 V solenoid actuated hydraulic valves with flow control and a maximum operating pressure rating of at least 1 MPa. Provide valves able to be serviced without removal from the line. Install a gate valve of the same size immediately upstream from each automatic control valve. House both valves in a valve box with high impact plastic cover at finished ground level.

Control wires: Connect the automatic valves to the controller with building wire laid in sealed conduits, with the mainline where possible. Lay intertwined for their full length without joints except within valve boxes. Use waterproof connection. Provide expansion loops at each solenoid lead or joint.

**Hold Point** - Backfill trenches only after inspection and approval of wiring.

Minimum size active 1.5 mm2. Minimum size common 2.5 mm2 laid in closed loop.

Sprinkler Heads

Provide heads which maintain a preset arc of throw, adjustable for radius, during watering operations and which are vandal-resistant.

Pop-up type heads: Heads designed to rise out of their housings under supply pressure to a minimum "pop-up" height of 50 mm.

Risers

Mount all in-ground heads on reticulated risers. Mount above ground on fixed risers.

Micro irrigation system

Polyethylene irrigation pipe: To AS 2698.1 Class IRRIG with barbed fittings of similar pressure rating fastened with ratchet type clamps. Lay pipe on finished ground surface under planting bed mulch and anchor at minimum 1.5 m intervals with U‑shaped stakes. Connect micro-tube laterals with proprietary push in or screw in fittings.

Microsprays: Mount microsprays on stakes 300 mm above ground and connect to the pipework with microtubes.

Drippers: Use drippers which are turbulent flow types, easily dismantled for cleaning. Connect directly into the pipework or with microtubes.

Micro irrigation valve box: Use micro irrigation valve boxes which are of high impact plastic with snap lock covers at finished ground level, each housing a stop cock, filter (200 mm for microsprays, 100 mm for drippers), pressure reducing valve (170 kPa outlet pressure) and automatic control valve.

|  |  |  |  |
| --- | --- | --- | --- |
| **Table – Irrigation Schedule** | | | |
| Fittings and attachments include but are not limited to those scheduled below for specific locations or fixtures: | | | |
| **Location** | **Item** | **Requirement** | |
| At points shown on drawings | External hose cocks | Type | To AS 3500 |
| Size | 20 mm |
| As on approved design plan | Sprinkler | Type | Gear driven |
| As on approved design plan | Automatic valve | Type | Solenoid operated |
| Size | Maximum pressure loss 20 kPa |
| As shown on drawings | Quick coupling valve | Type | Polypropylene |
| Size | 25 mm |
| As required to achieve uniform coverage | Microsprays | Type | No moving parts |
| At each plant | Drippers | Type | Turbulent flow |
| At each plant | Bubblers | Type | Adjustable from  0 ‑ 10 litres per minute. |

### Design plans – Hold Point

Hold Point - Submit drawings to Superintendent for approval indicating design proposals showing all pipework, sprinklers, valves and control systems.

### Setting Out

Mark out the positions of the irrigation lines prior to excavation and:

1. ensure completed surface levels are in accordance with the design plans; and
2. obtain the location of existing services from the relevant authorities and identify on the ground prior to excavation.

### Excavation

Excavate in accordance with AS/NZS 3500.1

Excavate to the lines, levels and grades as required for irrigation trenches. Trench depths and widths as required by AS 3500.1

Liaise with relevant authorities to locate existing services.

Excavate within one metre from existing underground services by hand only.

Damage to existing services and vegetation to be rectified at Contractor's expense.

The Contractor shall be deemed to have allowed for the cost of performing the required excavations in whatever material may be encountered, and no extra payment shall be paid for excavation in rock.

Cut back roots encountered in trenches to not less than 600 mm clear of the pipework. Remove such other obstructions including stumps, boulders and the like which may, in the opinion of the Superintendent, interfere with the pipework.

At road crossings, provide under road boring at right angles to the road centre line, by an approved specialist subcontractor. Place all pipeline beneath roadways in heavy duty conduit casing. Refer to DIRECTIONAL BORING section.

Stockpile topsoil on site.

### Installation

Install pipework in straight lines and uniform grades. Keep the number of joints to a minimum.

Install conduits and pipes having grade or class identification marking so that the marking is visible for inspection.

Lay all pipework under paths, paving or slabs in conduits.

Install according to irrigation design specifications.

Obtain approval from PowerWater - before connecting to water supply system.

Install all pressurised pipework, fittings and other fixtures to existing water supply system as well as Class 12 UPVC and above pipework by a qualified plumber licensed in the Northern Territory.

Provide 50 mm thick compacted bedding of clean granular sand free from stones and other debris over the total width of all excavations.

Clean all surfaces of UPVC joints with an approved cleaning fluid prior to jointing.

Solvent weld all UPVC joints, unless otherwise specified.

Flush all pipework prior to the attachment of sprinklers, drip emitters and the capping of pipeline ends.

Install and connect all fixtures shown on the design plans in a neat, waterproof manner and in accordance with the manufacturer's instructions .

Install all 240 volt electrical work by a qualified electrician licensed in the Northern Territory. All wiring and jointing shall use PowerWater approved materials. Join 240 V electrical wiring with a waterproof jointing kit.

Place all solenoid valve wiring beside the appropriate pipework in the conduit. Size conduit to allow free movement of wiring and draw wire.

Run all electrical wire in continuous lengths between the controller and valve. Ensure the wire is not kinked.

Ensure adequate length of wire is available at valves during installation to enable future replacement of valves.

### Water Source

Liaise with PowerWater as DIPL’s service liaison consultant in relation to water supply requirements associated with this contract.

Carry out the excavation necessary to locate and expose the connection point. On completion, reinstate surfaces and elements which have been disturbed such as kerbs, footpaths and nature strips.

Obtain approval from PowerWater before connecting to the water supply system.

### Testing – Hold Point

Check pipe joints, valve seats, tap washers, strainers and other elements for leaks. Repair or replace if damaged, and retest.

Provide all equipment necessary for testing.

All joints and connections are to remain visible during the test.

Measure pressure at the lowest section of pipework being tested.

Pressure minimum of 800 kPa shall be maintained for a minimum period of two hours in all pressure pipework and fittings up to and including the solenoid valves, except in spray, drip, and micro sprinklers.

Repair and retest all leaks prior to acceptance.

**Hold Point** - Obtain Superintendent's approval to proceed with backfilling other than spot filling to retain pipework from movement during pressure testing.

### Backfilling

Generally: Backfill trenches as soon as possible after approval of laid and bedded service.

Provide clean granular sand cover around the pipe and to a compacted thickness of 100 mm above the pipe.

Compact the sand with a vibrating plate or similar.

Place and compact select fill conforming to the PAVEMENTS AND SHOULDERS Section to 100 mm below existing surface. Compact to density of surrounding material.

Place 100 mm of topsoil over select fill and treat similar to existing surface.

Remove all surplus material from site.

Ensure the surface of all backfilling does not pond water.

Remedy any surface settlement due to backfilling during the maintenance period.

### Telemetric Control Station Details

Telemetric operated Irrigation control stations shall be constructed to comply with the following requirements. Refer to drawing R09-3124. Refer to REFERENCED DOCUMENTS.

MATERIALS:

**Mounting post**

* 3600 mm (length) x 75 mm square hollow section (SHS) of 3 mm gauge steel, sealed at both ends with welded steel plates.
* It shall have two horizontal metal brackets, 300 mm x 60 mm x 3 mm gauge, welded to it in the positions specified on the design drawings for mounting a control box. When constructed it shall be hot dip galvanized.

**Lockable stainless steel control cabinet**

* 600 mm (height) x 400 mm (width) x 200 mm (depth)
* The lock shall be incorporated into the design and the box shall be of sturdy ‘vandal-proof’ construction.

**Stainless steel whip aerial**

RF Industries model CD 28-41-70.

**Irrigation controller**

Must be compatible with Motorola IRRInet

**Radio**

Motorola Model GP328

Frequency - one of either of the following frequencies, depending on the location of the irrigation system within the Greater Darwin area (details of which can be obtained from the Superintendent).

* Area A – 150.825mhz
* Area B – 155.425mhz

**Solar panel**

Must have sufficient capacity to maintain the charge in the batteries of the control station equipment

INSTALLATION:

* Position the control station in the location specified in the design drawings.
* Position the post 600 mm into a concrete footing. The footing shall have minimum dimensions of 350 mm diameter x 650 mm deep. The post must be vertical.
* Affix the control box securely to the mounting brackets
* The base of the box shall be 1350 mm above the ground
* Use 4 x 316 stainless steel bolts with round heads to prevent theft
* Bolt head must be on the outside of the box with the nuts inside
* Control equipment will be affixed securely to the inside of the box and arranged neatly for ease of operation.
* Cabling
* cabling shall be run internally through the mounting post
* Flexible conduit shall be inserted in the entry and exit points to prevent chafing
* Conduits will be joined with a weatherproof seal
* Conduit shall be used between the post and the control box to provide weather proofing.
* Aerial shall be mounted vertically on top of the post.
* Solar panel
* Mount on top of the post
* Mount at an angle of 11 degrees to the horizontal with the cells facing north.

### As Constructed Drawings – Hold Point

All changes and variations to the design shall be recorded during construction, particularly items that are covered or become inaccessible.

Mark up the changes in red pen on paper hardcopies of the drawings in A3 size format and provide this data to the Superintendent at the time of practical completion of the works.

**Hold Point** - Provide As Constructed drawings of the irrigation system in electronic CAD format (AutoCad or Microstation) to the Superintendent within two weeks of practical completion. Drawings are to show as installed locations of all pipework, fittings, sprinklers, control valves, controllers, wiring, accessories etc.

## ESTABLISHMENT Period

Dryland grass areas shall be kept green and actively growing until continuous healthy grass cover has been achieved (minimum 13 weeks); then the watering programme shall be adjusted gradually until the grass is hardened off to natural climatic conditions. Such adjustment to the watering programme shall be completed within the overall Defects Liability Period in the ANNEXURE TO CONDITIONS OF CONTRACT.

* Keep the site neat and tidy at all times.
* Ensure the irrigation system is maintained and performs in accordance with the design plans. The operating schedule is to be adjusted to suit wet/dry season conditions. Prevent excessive watering.
* Keep the root ball of all plants moist at all times.
* Keep all plants and grass in a healthy actively growing state.
* Keep the whole site weed free.
* Repair eroded areas and re‑establish to maintain the design.
* Replace all damaged, dying or dead plants within 10 working days.
* Maintain all plantings free from insects, pests and diseases.
* Fertilise all plantings and grass in accordance with the Tables Fertilisers And Fertiliser Application Rates, ensuring to work any fertilizer into the soil around the base and dripline of the plant to prevent runoff.
* Ensure mulch is maintained at the specified levels.
* Ensure all stakes and ties remain secured with adjust ties to suit plant growth. Replace broken stakes and ties immediately.
* Prune trees and shrubs as required, or as directed by the Superintendent, to encourage dense bushy growth; use only qualified personnel.
* Prune established trees for a 3 m clearance where high profile machinery will be required to use the area regularly.
* Remove all branches sweeping the ground.
* Remove all pruning within 2 m of the ground to within 10  mm of the main stem.
* Keep ground cover plants free of dead vegetation.
* Mow grass when grass height exceeds 100  mm and in accordance with the clause titled Mowing.
* Remove grass cuttings from site.
* Trim neatly all edges of grassed areas at the same time as mowing.
* Keep all stormwater drains clean of debris and silt to allow unrestricted flow of stormwater run‑off.
* Remove termite mounds and treat the specific site with Fipronil.
* Use all insecticides and fungicides for the control of termites/insects and other infestations in accordance with the manufacturer's instruction.

### Establishment Period Records

* Maintain accurate current records of all maintenance work during the establishment period, including; the number of employees on site and the work conducted.
* Unscheduled audits may be conducted by the Superintendent throughout the 16 week period.

Records shall be presented upon request.

# Measurement And Payment

The following Measurement and Payment clauses refer to the specification sections of the same name, however, the clause numbers do not necessarily match the section numbers of the same title.

## ENVIRONMENTAL MANAGEMENT

### Environmental Management Generally

Not measured separately.

Include the cost of all required environmental management in the rates for the applicable items.

### Environmental Management Plan

Measured as an item.

Make allowance to include the ESCP.

### Cleaning of Vehicles and Plant

Not measured separately.

Include the cost of environmental management in the rates for the applicable items.

### Relocate Cycads – PROVISIONAL QUANTITY

Measured by number relocated.

Make allowance to survey the number of individual cycads within all areas to be cleared and allow for the legal removal and permanent relocation off site.

## Miscellaneous Provisions

### Establishment

The sum for establishment not to exceed 30 per cent of the Tender Sum.

Mobilisation: Measured as an item. Not to exceed 10 per cent of the Tender Sum.

Payment when the Contractor established on site.

Demobilisation: Measured as an item.

Payment when demobilisation complete.

Ongoing costs: Measured as an item.

Payment progressively during the contract in proportion to the value of complying work.

### Project Notice Boards

Measured by number erected.

### Control Station Check Survey

Measured as an item.

### As Constructed Information

Measured as an item.

Include the cost for provision of a completed updated set of the Auto Cad drawing files to accurately illustrate the as-constructed works. Make allowance for updating all drawings, including up-revving the project drawings to ‘As-Constructed’ in accordance with NTG Technical records drawing archiving requirements.

### Level Checking

Measured as an item.

### Limit of Works Fencing

Measured as an item.

Make allowance for surveying and pegging the limit of works fencing as prescribed in the project drawings.

Make allowance for supply and installation of a fence consisting of star pickets, picket caps, three strands of tensioned fencing wire (top, middle and bottom), with UV stabilised shade cloth (orange in colour) fixed to the fence.

Make allowance for maintenance of the fence throughout the duration of works and removal of the fence at completion.

## Indigenous ENGAGEMENT

### Indigenous Development Plan

Not measured separately.

### Indigenous Employment Provisional Sum

Measured by hours worked.

Claims against the Indigenous Employment Provisional Sum must be accompanied by the Indigenous Employment Report.

### Indigenous Engagement Generally

Not measured separately

Include the cost of indigenous engagement in the rates for the applicable items.

## Provision For Traffic

### Traffic Management Control Plan

Not measured separately

### Provision for Traffic

Measured as an item.

Includes traffic management control plan, detours, temporary connections access to adjacent properties, traffic guidance’s, traffic control devices, temporary bridging, warning devices, maintenance and restoration.

Payment will be made progressively in proportion to the value of work carried out.

#### Variable Message Signs (VMB’s)

Measured as an item.

Make allowance for provision of VMB’s 14 days prior to the changes traffic condition and for the full duration of the changed traffic condition under construction. Allow for VMB’s at all approaches and or detours to the changed traffic condition in accordance with the approved Traffic Management Plan.

#### Temporary Bus Bay

Measured as an item.

Make allowance for providing a temporary bus bay to equal to or better standard than the existing bay.

Make allowance for maintenance throughout the duration of the contract period.

Make allowance for removal and reinstatement of temporary bus bay at completion of the works.

#### Site Access and Egress

Note measured separately

Make allowance for all site egresses to be sealed for 10m preceding a heavy duty rumble strip and to be sealed for a further 40m before entering a public road. Contractor is to allow for cleaning of sealed egresses as required to ensure public roads are kept in a clean and safe condition.

Make allowance for maintenance through the duration of the contract period.

### Gravelling of Detours

Not measured separately.

Make allowance for supply, delivery, and compaction of material.

### Sealing of Detours

Not measured separately.

Make allowance for the removal and disposal of seal and restoration work.

## Clearing Grubbing and rehabilitation

### Clearing and Grubbing

Measured as an item

Includes removing vegetation stripping and stockpiling, topsoil respreading, removal of un-recoverable fencing, drainage structures, old road surfaces and other obstacles.

Make allowance for stripping, stockpiling and respreading of the top layer.

Make allowance for replacement of stripped layer.

Make allowance for removal of excess stripped material off site.

### Stripping

Not measured separately.

Make allowance for stripping, stockpiling or removal from site.

### Respreading

Not measured separately.

Make allowance for respreading of the top layer.

Make allowance for replacement of the stripped layer.

### Treatment of Existing Sealed Surface

Not measured separately.

### Mulching

Measured as an item.

Make allowance for mulching demolished vegetation, removal of stumps, roots and grasses, stockpiling mulched material, spreading mulch and removing excess mulched material.

## Earthworks

Measurements are based on natural surface levels prior to stripping and are based on finished surface level,

### Earthworks in Cut

Measured in in-situ cubic metres.

Make allowance for excavation in material as found.

Make allowance for volumes affected by Clearing and Grubbing and Landscaping.

Make allowance for processing and stockpiling material suitable for fills or otherwise removal from site and disposal.

### Rock in Subgrade

Measured in in-situ cubic metres.

Payment only for works directed by the Superintendent.

Payment for excavation will be at a rate to be agreed and payment for filling is at the rate for Select Fill.

### Unsuitable Material Below Subgrade Surface other than Rock – PROVISIONAL QUANTITY

Measured in in-situ cubic metres.

Payment only for works directed by the Superintendent.

Payment for excavation is at the rate for Earthworks in Cut and payment for filling is at the rate for Earthworks in Fill.

### Earthworks in Fill

Measured in compacted cubic metres.

Make allowance for volumes affected by Clearing and Grubbing.

Make allowance for supply of all fills from either material won from site or imported material.

Make allowance for:

#### Scarify and re-compact general founding surface – measured in square metres.

#### Filter material – measured in cubic metres placed. Make allowance for geofabric separating layer on toe filter.

#### Embankment fill – measured in compacted cubic metres. Make allowance for material handling, transporting and stockpiling on site, blending on site to produce embankment fill to Specification and working to adjust moisture content to Specification. Make allowance for haul from blending/working area, dumping, spreading and compaction in fills.

### Other fills

Measured in compacted cubic metres.

Make allowance for hand compaction as and where required to achieve conformance requirements, including over existing sewer at Drain 5 crossing.

### Unsuitable Material Beneath Fill – PROVISIONAL QUANTITY

Measured in in-situ cubic metres.

Make allowance to survey the area before removal and after removal to accurately quantify the volume removed.

Payment only for works directed by the Superintendent.

Payment for excavation is at the rate for Earthworks in Cut and payment for filling is at the rate for Earthworks in Fill.

### Preparation and Maintenance of Subgrade Surface

Measured in square metres.

### Filling of Crab Holes in Subgrade

Measured in cubic meters.

Make allowance for supply and placement of lean mix concrete, including any plant and equipment necessary for pouring or pumping to completely fill the void to the satisfaction of the Superintendent. Make allowance for measuring the quantity placed.

Payment only for works directed by the Superintendent.

Payment will be made for the quantity of material used to fill each cavity as ordered and measured.

## Conformance Testing

### Conformance Testing

The Superintendent will pay for all conformance testing directly to the Panel Period Contractor selected to perform the conformance tests required under this contract and nominated as the Superintendent’s responsibility.

If the tests fail the cost of the failed tests will be a negative variation to the contract.

When testing has been ordered and the site is not ready for testing at the time specified by the Contractor, the Contractor will bear the cost of time and travel incurred by the Panel Period Contractor and the Superintendent, where applicable.

Where bituminous products are Non-Conforming: refer to the Superintendent for requirements if samples are non-conforming.

### Process Testing

The Contractor is responsible for the ordering up and payment for all process tests carried out.

This is not measured separately.

Include the cost of process testing under the relevant items in the Schedule of Rates.

### Project Control Plan

Not measured separately. Cost to be included in relevant items.

### Construction Program

Not measured separately. Cost to be included in relevant items.

Make allowance for updating the construction program monthly and providing this to the Superintendent in Microsoft Project Gantt Chart format, with critical path.

### Traceability

Not measured separately. Cost to be included in relevant items.

### Checklists, Records and Control of Defects

Not measured separately. Cost to be included in relevant items

## Pavement and Shoulders

Measured in square metres for each specified thickness and material.

Make allowance for pavement or shoulder materials outside the carriageway width not included in measurement.

Make allowance for geosynthetics where specified.

## Spray Sealing

### Calculation Accuracy

All calculations regarding payment to be to an accuracy of the nearest whole number.

### Preparation of Pavement

Measured in square metres of the prepared area.

### Prime Coat Enrichment Coat, Emulsion Coat, Primer Seal and Seal Coats

Measured in litres at 15 deg. C. Adjust volumes using the Table - Bitumen Equivalent Volumes.

Payment calculated for each spray run. Quantity sprayed is determined by dipping the sprayer tank for each spray run.

Allow for the temperature of the mixture in determining the actual application rate.

The designated volume is determined from the area sprayed and the rate of application indicated in the procedure for such area at 15 deg. C. Multipliers for reducing the volume of hot bitumen to the equivalent volume at 15 deg. C are contained in the Table Bitumen Equivalent Volumes.

For primers, enrichment coats, primer seals, polymer modified binder or emulsion seals the rate of application refers to the whole of the mixture.

Allow for adhesion agent in the rate for polymer modified binder.

Tapers are exempt from adjustment tables.

**Adjustment To Payment For The Sprayed Volume When The Spray Application Rates Equal Or Exceed 1.0 L/M2:**

(i) Application 90% to 95% of the designated volume:

Payment for the sprayed volume less one‑half the difference between the sprayed volume and 95% of the designated volume.

(Example: Application = 92% of designated volume.

Pay for (92% - 0.5 x (95% - 92%)) = 90.5% of designated volume.)

(ii) Application 95% to 105% of the designated volume:

Payment for the sprayed volume.

(iii) Application 105% to 115% of the designated volume:

Payment for 105% of the designated volume.

The Contractor must rectify bleeding or flushing seals during the defined defects period where binder application rates were applied at > than 105% of the designated volume.

(iv) Application less than 90% or more than 115% of the designated volume will be rejected. Rectify by methods approved by the Superintendent, at the Contractor’s expense.

**Adjustment To Payment For The Sprayed Volume When Spray Application Rates Below 1.0L/M2:**

(v) Application plus 0.1L/m2 and minus 0.1L/m2 of the designated spray rate:

Payment for the sprayed volume.

(vi) Application rates varying more than 0.1L/m2 of the designated spray rate will result in work being rejected. Rectification will be at the Contractor’s expense by respraying or by other methods approved by the Superintendent.

Payment will be made for the designated volume upon satisfactory rectification of the rejected area at no extra expense to the Principal.

Adjustment to payment for seal coat items (binder, additive, precoat, aggregate) is in accordance with the Table Payment Adjustments.

### Table - Payment Adjustments

|  |  |
| --- | --- |
| **Table Payment Adjustments** | |
| **Viscosity (at 60 deg. C Pa.s) of AS 2008 Class 320 Bitumen Component of The Binder** | **Reduction in Payment of Seal Coat Items** |
| Under 260 | 10% reduction for each 10 Pa.s (or part thereof) below 260. |
| 260 – 380 | Nil. |
| Over 380 | 10% reduction for each 10 Pa.s (or part thereof) over 380. |
|  | |
| **Where Samples Not Collected** | 10% reduction to rate per litre |
|  | |
| **Polymer Modified Binders** | **Reduction In Seal Coat Items** |
| Torsional Recovery 1 – 3% less than specified | 2% reduction to rate per litre |
| Torsional Recovery 4 – 6% less than specified | 10% reduction to rate per litre |
| Torsional Recovery over 6% less than specified | 20% reduction to rate per litre |
| Softening Point 0 – 2 deg. C less than specified | 5% Reduction to rate per litre |
| Softening Point 2.1 – 5 deg. C less than specified | 15% Reduction to rate per litre |
| Softening Point 5.1 – 10 deg. C less than specified | 20% Reduction to rate per litre |
| Softening Point 10.1 or more deg. C less than specified | \*Rejected (see note below) |
| Note: \* Rejected - Reseal with materials and methods approved by the Superintendent. Costs incurred from reseal work will be at the Contractor’s expense.  Note: Adjustments are only applied to materials represented by the test sample. | |

### Payment Adjustment Applied to Sub-Contractors

Where:

1. a payment adjustment is applied against the Contractor under the Contract; and
2. the Contractor then applies that adjustment to the sub-contractor that carried out the Works the subject of the payment adjustment,

The Contractor will provide the sub-contractor with a copy of the document/s from the Principal that evidence the payment adjustment applied to the Contractor.

### Table - Bitumen Equivalent Volumes

Equivalent Volumes of Bituminous Material Measured at Higher Temperature Converted to 15 deg. C (15 deg. C Converted Higher Temperature).

Interpolate to determine equivalent volumes at temperatures other than those specified.

|  |  |  |  |
| --- | --- | --- | --- |
| TEMP. (deg. C) | FACTOR | TEMP. (deg. C) | FACTOR |
| 15 | 1.0000 (1.0000) | 120 | 0.9356 (1.0688) |
| 40 | 0.9844 (1.0158) | 130 | 0.9296 (1.0757) |
| 50 | 0.9782 (1.0223) | 140 | 0.9237 (1.0826) |
| 60 | 0.9720 (1.0288) | 150 | 0.9178 (1.0896) |
| 70 | 0.9659 (1.0353) | 160 | 0.9119 (1.0966) |
| 80 | 0.9597 (1.0420) | 170 | 0.9060 (1.1038) |
| 90 | 0.9537 (1.0486) | 180 | 0.9002 (1.1109) |
| 100 | 0.9476 (1.0553) | 190 | 0.8944 (1.1181) |
| 110 | 0.9416 (1.0620) | 200 | 0.8886 (1.1253) |
|  |  | 210 | 0.8829 (1.1326) |

### Additives

Not measured separately.

Polymer additives in polymer modified binders not measured separately.

Make allowance in the rates for seal coats.

### Precoat Applied to Aggregate

Not measured separately.

Make allowance for adhesion agent.

### Stockpile Sites

Not measured separately.

Make allowance for stockpile sites in the relevant rates for sealing aggregate.

### Sealing Aggregate

Measured in square metres of finished aggregate work for each size of aggregate.

## DENSE GRADED Asphalt

### New Pavements

Measured in square metres for each specified thickness.

Payments will be determined as per PAYMENT ADJUSTMENTS clause.

### Payment Adjustments

Rates will be adjusted as follows:

|  |  |
| --- | --- |
| **REDUCTION LEVEL** | **PAYMENT REDUCTION** |
| Level 1 | 5% |
| Level 2 | 10% |
| Level 3 | 20% |
| Level 4 | 40% |

Note: Adjustments are for materials specified at 30mm and greater thickness.

**Bitumen Conformance**

**Class 320 Bitumen**

|  |  |
| --- | --- |
| **VISCOSITY (AT 60OC Pa.s) OF AS2008 CLASS 320 BITUMEN COMPONENT OF THE BINDER** | **PAYMENT REDUCTION** |
| Under 260 (Pa.s) | 5% reduction for each 10 Pa.s (or part thereof) less than 260 |
| 260 – 380 (Pa.s) | Nil. |
| Over 380 (Pa.s) | 5% reduction for each 10 Pa.s (or part thereof) over 380. |

**Polymer Modified Binder (A15E)**

| **POLYMER MODIFIED BINDERS A15E** | **PAYMENT REDUCTION\*** |
| --- | --- |
| Consistency (60oC Pas) 4500 - 4999 | 5% reduction to m2 rate ($) of lot |
| Consistency (60oC Pas) 4000 - 4449 | 10% Reduction to m2 rate ($) of lot |
| Consistency (60oC Pas) 4000 - 3000 | 20% Reduction to m2 rate ($) of lot |
| Consistency (60oC Pas) less than - 3000 | Remove and Replace |
| Torsional Recovery (25oC,30s,%)1% – 5% less than specified | 5% reduction to m2 rate ($) of lot |
| Torsional Recovery (25oC,30s,%) 6% – 10% less than specified | 10% reduction to m2 rate ($) of lot |
| Torsional Recovery (25oC,30s,%) over 10% less than specified | 20% reduction to m2 rate ($) of lot |
| Softening Point 0 – 5 oC less than specified | 5% Reduction to m2 rate ($) of lot |
| Softening Point 5.1 – 10 oC less than specified | 10% Reduction to m2 rate ($) of lot |
| Softening Point 10.1 – 15 oC less than specified | 20% Reduction to m2 rate ($) of lot |
| Softening Point more than 15.1 – 20.0 oC less than specified | 30% Reduction to m2 rate ($) of lot |
| Softening Point more than 20.1 oC less than specified | Remove and Replace |
| \* Payment reduction shall only apply to the test property providing highest level of non-conformance | |

**Rideability**

Adjustments to Rideability (per lot)

|  |  |
| --- | --- |
| **Increase in specified maximum IRI (per lot)** | **%Adjustment** |
| 0.01 – 0.10 | 2% Adjustment to the m2 rate of lot |
| 0.11 – 0.20 | 4% Adjustment to the m2 rate of lot |
| 0.21 – 0.30 | 6% Adjustment to the m2 rate of lot |
| 0.31 – 0.40 | 8% Adjustment to the m2 rate of lot |
| 0.41 – 0.50 | 10% Adjustment to the m2 rate of lot |
| 0.51 – 0.60 | 12% Adjustment to the m2 rate of lot |
| 0.61 – 0.70 | 14% Adjustment to the m2 rate of lot |
| 0.71 – 0.80 | 16% Adjustment to the m2 rate of lot |
| >0.80 | Remove and Replace / Rectify |

### Progress Claims

Contractor may claim up to three-quarters of the contract rate when works are physically completed on site with balance of payment following conformance test results.

### Payment Adjustment Applied to Sub-Contractors

Where:

1. a payment adjustment is applied against the Contractor under the Contract; and
2. the Contractor then applies that adjustment to the sub-contractor that carried out the Works the subject of the payment adjustment,

The Contractor will provide the sub-contractor with a copy of the document/s from the Principal as evidence that the payment adjustment applied to the Contractor.

## Miscellaneous Concrete

Make allowance for excavation, bedding and backfilling in the following items.

### Shared path gap kerb

Measured in linear metres.

Make allowance for replacing gap kerb with alignments matching to existing.

### Inverts

Measured in linear metres.

### Concrete spillway

Measured in square metres at finished surface level.

Make allowance for all formwork required to complete in the finished condition.

Make allowance for cut-off walls at upstream and downstream edges.

Make allowance for moisture barrier, placing of reinforcement, placement and finishing of concrete.

Make allowance for tooled joints and expansion joints.

### Culvert 5 sewer crossing

Measured as an item.

Make allowance for all excavation, formwork, sand bedding, moisture barrier, reinforcement concrete, finishing, backfill and compaction.

## Drainage Works

### Excavation in Trenching

Not measured separately.

Make allowance for shoring, bedding, inlet and outlet structures and irregularities in the natural surface where applicable.

### Excavate, Supply, Load, Transport, Bed, Lay and Backfill Culverts

Measured in linear metres along the invert of the culvert as the distance between the outside face of headwalls or other structures for the type and size scheduled.

Multiple barrel culverts are measured as the single distance between the outside face of headwalls or other structures.

Make allowance for in-situ reinforced concrete floor slabs, including for moisture barrier, and haunching to restrain lateral movement.

Contractor to confirm size of reinforced concrete box culverts required for extending Culvert 2 to match to existing size.

Make allowance for sealing joints to Specification.

Payment shall be made at the completion of backfilling.

### Excavate, Supply, Load, Transport, Bed and Lay Culverts through Embankment

Measured in linear metres along the invert of the culvert as the distance between the outside face of headwalls or other structures for the type and size scheduled.

Multiple barrel culverts are measured as the single distance between the outside face of headwalls or other structures.

Make allowance for in-situ reinforced concrete floor slabs, including for moisture barrier, and haunching to restrain lateral movement.

Contractor to confirm size of reinforced concrete box culverts required for extending Culvert 2 to match to existing size.

Make allowance for sealing joints to Specification.

Payment shall be made at the completion of laying.

### Concrete Headwalls

Measured by number.

Make allowance for supply and installation in the completed condition as shown on the project drawings.

### Interface with Existing Culverts

Measured by number and type.

Make allowance for connections as detailed on the project drawings.

### Demolish and remove existing drainage structures

Measured as an item for each structure removed.

### Safety Grates at Ends of Culverts

Measured by number for each culvert configuration.

### Concrete Lined Open Drains

Measured in square metres at finished surface level.

Make allowance for excavation to form drain.

Make allowance for moisture barrier, formwork, placing of reinforcement, placing and finishing of concrete to bed and batters of drain.

Make allowance for concrete drop structures 1A and 1B.

### Open Unlined Drains

Measured in linear metres.

Make allowance for local widening and grading out at Drain 4.

### Re-shape Existing Open Unlined Drains

Measured as an item including Drains 3 and 5.

Make allowance for matching to existing at downstream end of Drain 5.

### Culvert 1 Access Pits

Measured by number.

Make allowance for all supply and installation of access pits in the completed condition as shown on the project drawings.

## Protection Works

### Geotextile Fabric

Not measured separately

Make allowance in the relevant sections.

Make allowance for supply and placement.

Make allowance for laps and folds.

### Reno Mattresses

Measured in square metres.

Make allowance for supply and installation in the completed condition as shown on the project drawings.

Make allowance for excavation, steel wire mesh, trimming and shaping, connection to culvert aprons and stone filling.

### Grouted Stone Pitching

Measured in square metres of the face area.

Make allowance for weep holes.

### Gabion Drop Structures

Measured as an item.

Allow for tying together of reno mattresses and gabions.

Allow for geotextile.

## Road Furniture And Traffic Control Devices

### Pedestrian Fencing (Fence Type 3)

Measured in linear metres.

Make allowance for clearing of fence lines.

Make allowance for concrete mowing strips.

### Proprietary Steel Fencing (Fence Types 1 and 2)

Measured in linear metres.

Make allowance for clearing of fence lines.

Make allowance for balustrade panels and platform fixing over culvert end walls and wing walls.

Make allowance for gates, padlocks and keys.

### Stock Fencing (Fence Type 4)

Measured in linear metres.

Make allowance for clearing of fence lines.

### Access gates

Measured by number and type installed.

### Guide Posts

Not measured separately. Include in cost of road construction.

Make allowance for delineators.

### Signs, Supply and Install

Measured by number and type.

### Reinstate/Relocate Existing Road Signs

Measured by number.

### Pavement Marking

Measured as an item.

Make allowance for the specified spherical glass beads with all markings.

Make allowance for reinstatement of all pavement marking affected by the works.

Make allowance for reinstatement of pavement marking on shared path.

### Raised Retroreflective Pavement Markers

Not measured separately. Include in cost of pavement marking.

### Remove and Reinstate Vehicle Barrier

Measured in linear metres.

### Remove and Dispose of Steel Beam Guardrail

Measured in linear metres.

## Landscape

### Site Preparation

Not measured separately. Included in EARTHWORKS section.

Make allowance for any filling and levelling required.

### Topsoil

Not measured separately. Included in EARTHWORKS section.

Make allowance for any filling and levelling required prior to dryland grassing.

### Trees, Shrubs and Ground Covers

Measured by area planted out in square metres.

Make allowance for supply of plants, mulch, fertilisers, excavation of planting holes, planting and watering.

### Temporary Irrigation

Not measured separately.

Make allowance for any irrigation design requirements, cost of approvals and connection to the water supply..

Make allowance for watering the grass from installation to not less than 13 weeks from practical completion of the works.

Make allowance for gradually reducing the watering rate until the grass is hardened off to natural climatic conditions.

Note that cost of water will be borne by the Contractor.

### Dryland Grassing

Measured in square metres.

Make allowance for reseeding.

Make allowance for temporary irrigation and watering.

Make allowance for supply and installing embankment and cut batter protection (i.e. hydro mulching, Jute, Propex Landlok or equivalent) as shown on the project drawings.

### Removal of trees or shrubs to comply with setbacks from embankment toe

Not measured separately.

Include in CLEARING AND GRUBBING.

### Protection of existing vegetation

Not measured separately.

Included in preparation and implementation of environmental management plan.

### Watering

Note Measured Separately.

Make allowance for watering in the relevant sections.

Note that the cost of water will be borne by the Contractor.

### Jute matting embankment protection

Not Measured Separately.

Make allowance for supply and installation in Dryland Grassing.

Make allowance for installation as per manufacturer’s recommendations and as shown on the project drawings.

### Turf Reinforcement Propex Landlok 450 or equivalent

Not Measured Separately.

Make allowance for installation including anchoring as per manufacturer’s recommendations and as shown on the project drawings.

Make allowance in for supply and installation in Dryland Grassing.

# REFERENCED DOCUMENTS

## Australian Standards

| **Referenced Documents – Australian Standards** | | |
| --- | --- | --- |
| AS 1012 (set) | - | Methods of testing concrete |
| AS 1074 | 1989 | Steel tubes and tubulars for ordinary services |
| AS 1111 (set) | 2015 | ISO metric hexagon commercial bolts and screws - Product Grade C |
| AS 1112 (set) | 2015 | ISO metric hexagon nuts |
| AS 1141 | - | Methods for sampling and testing aggregates |
| AS 1141.0 | 1999 | * List of Methods |
| AS 1141.1 | 2015 | * Definitions |
| AS 1141.2 | 2015 | * Basic testing equipment |
| AS 1141.3.1 | 2012 | * Sampling - Aggregates |
| AS 1141.11.1 | 2009 | * Particle size distribution – Sieving method |
| AS 1141.14 | 2007 | * Particle shape, by proportional calliper |
| AS 1141.15 | 1999 | * Flakiness index |
| AS 1141.18 | 1996 | * Crushed particles in coarse aggregate derived from gravel |
| AS 1141.20.1 | 2000 | * Average least dimension - Direct measurement (nominal size 10 mm and greater) |
| AS 1141.20.2 | 2000 | * Average least dimension – Direct measurement (nominal size 7 mm and 5mm) |
| AS 1141.20.3 | 2000 | * Average least dimension – Calculation (nomograph). |
| AS 1141.23 | 2009 | * Los Angeles value |
| AS 1141.24 | 2013 | * Aggregate soundness – Evaluation by exposure to sodium sulphate solution |
| AS 1141.25.1 | 2003 | * Degradation factor – Source rock |
| AS 1141.26 | 2008 | * Secondary minerals content in igneous rocks |
| AS 1141.29 | 2014 | * Accelerated soundness index by reflux |
| AS 1141.40 | 1999 | * Polished aggregate friction value - Vertical road-wheel machine |
| AS 1141.41 | 1999 | * Polished aggregate friction value – Horizontal bed machine |
| AS 1141.50 | 1998 | * Resistance to stripping of cover aggregates from binders |
| AS/NZS 1158 (set) | - | Lighting for roads and public spaces |
| AS 1160 | 1996 | Bitumen emulsions for construction and maintenance of pavements |
| AS/NZS 1163 | 2009 | Cold-formed structural steel hollow sections |
| AS 1231 | 2000 | Aluminium and aluminium alloys - Anodic oxidation coatings |
| AS/NZS 1252 | 1996 | High strength steel bolts with associated nuts and washers for structural engineering |
| AS 1273 | 1991 | Unplasticised PVC (UPVC) downpipe and fittings for rainwater |
| AS 1289 (set) | - | Methods of testing soils for engineering purposes |
| AS 1289.0 | 2014 | * Definitions and general requirements |
| AS1289.1.1 | 2001 | * Soil classification tests - Sampling and preparation of soils – Disturbed soil samples (Includes Amdt 1:2002 and Amdt 2: 2008) |
| AS1289.2.1.1 | 2005 | * Soil classification tests - Moisture content – Oven drying method (standard method) |
| AS 1289.3.1.1 | 2009 | * Soil classification tests - Determination of the liquid limit of a soil – Four point Casagrande method |
| AS 1289.3.2.1 | 2009 | * Soil classification tests - Determination of the plastic limit of a soil – Standard method |
| AS 1289.3.3.1 | 2009 | * Soil classification tests - Calculation of the plasticity index of a soil |
| AS 1289.3.4.1 | 2008 | * Soil classification tests - Determination of the linear shrinkage of a soil – Standard method |
| AS 1289.3.6.1 | 2009 | * Soil classification tests - Determination of the particle size distribution of a soil – Standard method of analysis by sieving |
| AS 1289.3.7.1 | 2002 | * Soil classification tests - Determination of the sand equivalent of a soil using a power-operated shaker |
| AS 1289.5.1.1 | 2003 | * Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort |
| AS 1289.5.2.1 | 2003 | * Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort |
| AS 1289.5.4.1 | 2007 | * Soil compaction and density tests – Compaction control test - Dry density ratio, moisture variation and moisture ratio |
| AS 1289.5.8.1 | 2007 | * 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 | 2014 | * Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil – Standard laboratory methods for a remoulded specimen |
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## ACTS, REGULATIONS AND CODES APPLICABLE TO THE WORKS AND AUTHORITIES WITH JURISDICTION OVER THE WORKS INCLUDE, BUT ARE NOT LIMITED TO;

**ACTS & REGULATIONS**

Aboriginal Sacred Sites Act

Bushfires Act

Control of Roads Act

Dangerous Goods Act and Regulations

Environment Protection and Biodiversity Conservation Act

Environmental Assessment Act

Environmental Offences and Penalties Act

Environment Protection and Biodiversity Conservation Act

Fair Work Act 2009

Food Act 2004

Heritage Conservation Act

NT Building Act and Regulations

NT Planning Act and Regulations

Poisons and Dangerous Drugs Act and Regulations

Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations

Soil Conservation and Land Utilisation Act

Territory Parks and Wildlife Act

Territory Parks and Wildlife Conservation Act

Traffic Act and Regulations

Waste Management and Pollution Control Act

Water Act

Weeds Management Act

Work Health and Safety Act and Regulations

**CODES AND GUIDELINES**

Building Code of Australia (BCA)

CASA Directives

CASA Manual of Standards

NT Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Re-use of Sewage Effluent.

NT Deemed to Comply Manual

NT Health and Safety Guidelines for Commercial Kitchens

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NT Fire and Rescue Service (NTFRS)

NT WorkSafe

PowerWater Corporation of the NT (PWC)

Requirements of the engaged Building Certifier

Requirements of the Local Municipal or Shire Councils

## Other Referenced Authorities And Documents

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| APAS | Australian Paint Approval Scheme |
| APVMA | Australian Pesticides and Veterinary Medicines Authority |
| AGBT | Austroads Guide to Bridge Technology |
| AGPT | Austroads Guide to Pavement Technology |
| AGPT04H/08 | Austroads Guide to Pavement Technology – Part 4H: Test Methods |
| AGRD | Austroads Guide to Road Design |
| CASA | Civil Aviation Safety Authority |
| ISSA | International Slurry Surfacing Association |
| NATA | National Association of Testing Authorities |
| NTCP | Northern Territory Code of Practice |
| NTMTM | Northern Territory Materials Testing Manual |
| NTTM | Northern Territory Testing Methods |
| WA 730.1 | Main Roads Western Australia, Bitumen Content and Particle Size Distribution of Asphalt and Stabilised Soil: Centrifuge Methods |
|  | NRETAS Fact Sheet “Guidelines for Water Extraction as they relate to Road Construction and Maintenance.” |
| **SPECIFICATIONS** | Electronically available: <https://infrastructure.nt.gov.au/specification-services> |
|  | Standard Specification for Environmental Management |
|  | Standard Specification for Small Building Works |
|  | Standard Specification for Road Maintenance |

# NORTHERN TERRITORY CLIMATE ZONES TABLE

