

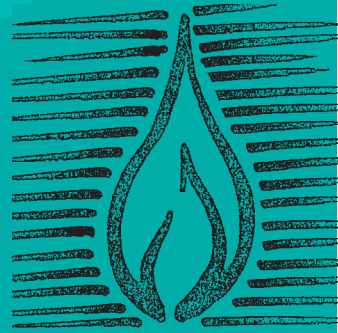
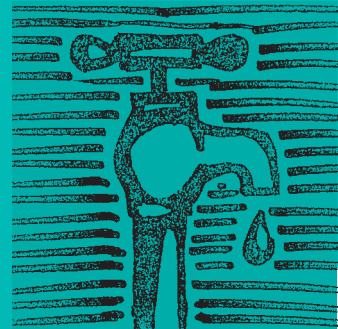
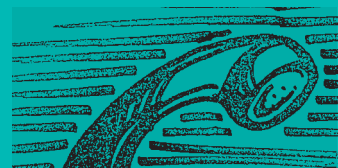
RESTORATION AND REINSTATEMENT

RESTORATION AND REINSTATEMENT SPECIFICATION

FOR LOCAL GOVERNMENTS
IN WESTERN AUSTRALIA



Institute of Public Works
Engineering Australia
WA Division Inc.



RESTORATION AND REINSTATEMENT SPECIFICATION FOR LOCAL GOVERNMENTS

This Specification has been endorsed by the Utility Providers
Services Committee (Western Australia)



**Institute of Public Works
Engineering Australia
WA Division Inc.**

**Produced by the Institute of Public Works
Engineering, Australia (WA Division)**

Applicable from October 2002

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I. RESTORATION OF NON-TRAFFICABLE AREAS (PRIVATE PROPERTIES, ROAD VERGES AND PUBLIC OPEN SPACES)

I.1 GENERAL REQUIREMENTS

The Contractor shall engage the services of a qualified horticulturist in an advisory capacity for the duration of the Contract.

The Contractor shall obtain onsite guidance regarding restoration from the horticulturist both as necessary and to the satisfaction of the Superintendent.

Sheds, lawns gardens, street trees, street furniture, fences, walls, pavements and other property improvements which have been affected by construction work shall be restored to the pre-construction condition and/or as specified herein using new materials, plants and turf as necessary.

All trenches left open shall be securely barricaded, sign posted and illuminated in accordance with statutory and regulatory requirements.

Restoration work shall be managed so as to comply with specific conditions including the sequence and completion time constraints for various work components as specified in the respective Sections of the Specification or as detailed on Drawings.

I.2 DEFINITIONS

“Restoration” in this section is the work undertaken to reinstate a disturbed non-trafficable area of the road reserve, private property or public open space.

I.3 DETAILED RESTORATION REQUIREMENTS

1.3.1

Structures and Paving (Private Properties)

In private properties all structures (eg. fences, walls, sheds, garden beds) paving (eg. brick, concrete) concrete slabs and footpaths shall be restored at least to previous condition and dimensions by competent and experienced specialist tradesmen (and/or subcontractors), using compacted bedding new imported materials as necessary and work practices to recognised manufacturer’s requirements and Australian Standards for these works.

1.3.2

Footpaths

The trench backfill shall be as specified to within 200mm of the surface over the width of the footpath crossing (and 0.1m beyond each edge) and then sand bedding of minimum 95% MOD 100mm compacted thickness shall be provided.

Sawcuts shall be made at existing panel joints each side of the damaged section. The panel shall be replaced with a 100mm thick concrete slab (poured insitu) with broomed finish and isolation expansion joints of suitable full depth bitumen impregnated fibre board (or equivalent) at both ends of the restored footpath section. Transverse contraction joints of minimum depth of 20mm shall be spread at intervals not exceeding 2.0m along the path and expansion joints shall be spaced at a maximum of 6.0 metre. Concrete shall be a suitable mix of 25MPa compressive strength at 28 days as specified for kerbing in Clause 2.6.3. Curing shall be carried out as specified in Clause 2.6.6.

1.3.3

Shrubs, Trees, Plants and Garden Beds

Advice from the Local Government and Superintendent shall be sought by the Contractor

regarding trees and shrubs requiring removal or trimming prior to this work commencing on site.

Trees, shrubs, plants and garden beds that are damaged or removed shall be replaced using advanced trees (of the same species as those removed) matured to at least three years and shrubs and plants to the property owner's satisfaction. The surface is to be restored using the stockpiled topsoil for the top 200mm compacted to a density of the surrounding soil. The areas shall be mulched as necessary to match surroundings or previous condition.

All damaged borders/walls surrounding garden beds shall be fully restored using new materials as necessary.

1.3.4

Ungrassed/Sparsely Grassed Surfaces

The surface of ungrassed/sparsely grassed surfaces shall be reinstated using the stockpiled topsoil raked to a smooth level finish. The areas shall be top dressed lightly with suitable sand and raked as necessary to remove all ruts and depressions.

1.3.5

Grassed/Lawn Areas (unable to be turfed)

The stockpiled topsoil of grassed/lawn areas (unable to be turfed) shall be re-spread, raked smooth and watered. If necessary, it shall be rotary hoed to break up lumps and lightly top dressed with a suitable sand to create a surface equal in appearance to the surrounding area. Shredded lawn or grass runners shall be planted and established. The planting shall be suitably fertilised and watered in.

1.3.6

Established Lawns (able to be turfed)

The underlying layers of topsoil previously stockpiled shall be replaced and raked smooth. If necessary, the area shall be rotary hoed to break up lumps.

The previously stripped and stacked turf shall then be re-laid and lightly compacted. A light top dressing of suitable sand shall then be applied, the surface raked to a smooth, neat appearance and the area watered.

In the event of the turf dying or deteriorating before the formal acceptance of this work, as specified in Clause 1.3, the Contractor shall replace the turf using new turf of the same species obtained from a reputable commercial nursery. The turf shall be suitably fertilised before watering in.

1.3.7

Contaminated Topsoil

If the stockpiled topsoil has been contaminated during construction, the Contractor shall provide clean loam fill for the top 200mm compacted to the density of the surrounding top soil.

1.3.8

Sprinklers and Reticulation Systems

Sprinkler and Reticulation systems shall be restored, using new parts as necessary, to achieve a standard of working order as previously agreed with the property owner by the Contractor.

Failure to agree any reduced standard in writing with the property owners/occupier previous to the disturbance of reticulation shall render the Contractor liable to return the system to full working order, despite it's previous condition.

1.4 ACCEPTANCE REQUIREMENTS

1.4.1

Maintenance until Acceptance

The Contractor shall be responsible for, and maintain restoration, for each property and adjacent verge until it has been formally accepted.

Alternative arrangements by the Contractor with any of the respective owners/occupier shall not diminish the responsibility of the Contractor in this regard.

1.4.2*Final Acceptance of Restoration Works
(Non-Trafficable Areas)*

Acceptance of restoration work will include acceptance of restoration of private properties as confirmed in writing by the respective property owners. The acceptance of the verges by the local authority must be endorsed by the Superintendent, after inspection by the local authority, in order for the Contractor to have reached full compliance under this Clause.

Acceptance of restoration work standards by the owners of properties affected by the work shall be in the format of a signing off of the previously issued Notice of Entry by the property owner.

In the event of disagreement between the Contractor and an owner regarding disturbed services, plant or property, the standard of restoration work for the purpose of acceptance shall be determined by the Superintendent. In the further event of the owner not being available, the Contractor should obtain the signature of bonafide agent of the owner on the acceptance form.

The above notwithstanding, any subsidence of an area of restoration shall be remedied by the Contractor within two (2) working days of the occurrence and/or notification of such defect. These repairs shall be carried out by the Contractor as necessary to maintain the safety of the Site to the satisfaction of the Superintendent otherwise the Local Government will be authorised to carry out the remedial work at the Contractor's cost.

2.**RESTORATION OF
TRAFFICABLE AREAS
(ROAD PAVEMENTS)****2.1 SCOPE AND DEFINITIONS****2.1.1***General*

This section of the Specification shall apply to the reinstatement of pavements, (including driveway crossovers) kerbing and stormwater drainage works disturbed during the construction of utility infrastructure.

2.1.2*Workmanship*

The Contractor shall ensure that all works are completed to the minimum requirements as specified. The works are to be carried out using skilled employees and/or sub-contractors with proven expertise and experience in this field of work; to the satisfaction of the Superintendent.

2.1.3*Definitions*

“Local Government” shall mean the Local Government in whom the affected roads, right of ways, public access ways and reserves are vested, and shall include any duly authorised officer of that Local Government.

“Pavement” shall include any road, footpath or driveway pavement: with spray sealed flexible pavements, asphaltic concrete paving, brick paving, concrete slabs or other.

“Restoration” in this section is the work undertaken to reinstate a disturbed trafficable area (or road pavement) of the road reserve.

2.1.4

Authority to Inspect Works by Others

The Contractor shall permit the Local Government's Inspector to enter upon the Works at any time for the purpose of inspecting and assessing the reinstatement of trenches and pavements and verges.

2.1.5

Authority to Give Instructions

All instructions to the Contractor shall be given by the **Superintendent** or its representative.

2.2 PLANNING REQUIREMENTS

The Contractor shall within 14 days of being awarded the Contract submit proposals for approval by the Superintendent (and the Local Government) for:

- discharge of dewatering into the existing stormwater drainage;
- location for storage/spoil sites/site compounds;
- sub-base and basecourse materials - tests of bulk samples;
- spray sealing, including spray rates and aggregate applications for bituminous seals;
- job mixes for asphaltic concrete (if applicable).

For any **traffic diversion** the Contractor shall refer to the traffic management requirements of the Utility Providers Code of Practice (2002).

The Contractor shall present a traffic management plan to the Local Government, advertise road closures in the local community newspaper and implement traffic management requirements of the Utility Providers Code of Practice (2002).

The Contractor shall also:

- a) obtain and conform with Local Government standard stormwater drainage pit drawings, drainage pit reconstruction requirements, kerb-type requirements and stormwater construction specification; and

- b) advertise commencement of the Works to the Local Government's requirements in the local community newspaper;
- c) give a minimum of ten working days notice prior to commencement of excavation work on Site and:
 - arrange an initial condition inspection of the Local Government's improvements/roadways with the Local Government and the Superintendent.
 - record the level of the deterioration of the Local Government's improvements and agree such recording with the Superintendent before any disturbance of the roadways occurs on Site. (Photographs and video recordings shall be included as necessary);
 - provide the Superintendent for approval the intended program of road restoration works including the elected pavement restoration proposals in accordance with the specification (pavement layer/wearing surface thickness and materials) for each street \roadway, to the Superintendent for approval. The Contractor shall hand excavate the existing pavements sufficiently to confirm the existing pavement material types and thicknesses in determining the restoration requirements for each street/test lot.
 - complete an As Constructed survey (and submit the 1:10 natural scale drawings) of the existing sealed roads with cross-sections at 10m intervals and levels of low points along the entire extent of the roadways to be affected by the utility infrastructure works, unless otherwise approved by the Superintendent.
 - report all unauthorised disturbance/damage to the Local Government's improvements to the Superintendent within one (1) day of occurrence of the event.

2.3 PAVEMENT CONSTRUCTION

2.3.1

Pavement Layers

The pavement shall consist of:

- a) subgrade;
- b) flexible pavement including
 - sub-base;
 - base course;
 - sub-base and combined base course; and
 - thick lift asphalt basecourse
- c) wearing course including
 - prime (or Primer seal) and Bituminous Spray Seal;
 - prime (or Primer seal) and Asphaltic concrete;
 - two Coat Seal; and
 - concrete.

2.3.2

Subgrade

Materials used for backfilling of trenches shall be clean sand free of clay and compacted in layers with a maximum depth of 300mm.

The Contractor shall allow to reinstate the pavement to pre-existing As-Constructed levels as surveyed previously. Notwithstanding this requirement, the Contractor shall adjust the finished pavement levels locally to ensure the road is free draining and there are no undrained areas isolated from main drainage points.

The subgrade shall be compacted to a minimum of 95% Modified Dry Density Ratio in accordance with either AS 1289.5.4.1 or AS 1289.5.4.2. Where assigned values are used under AS 1289.5.4.2, the validity of the assigned Maximum Dry Density and Optimum Moisture Content shall be verified for conformance with the standard on a continual

basis. Where the materials tested are too variable to produce an assigned value complying with the limits specified in AS 1289.5.4.2, testing shall be carried out to AS 1289.5.4.1 This standard requires the laboratory Dry Density/Moisture Content Relationship to be determined at each site tested for field density determination.

The laboratory Dry Density/Moisture Content Relationship shall be determined in accordance with AS 1289.5.2.1 with the value adjusted for the presence of any oversize materials as required by AS 1289.5.4.1.

The subgrade shall be graded smooth, free of any loose foreign materials across its width and level, and uniformly compacted.

The Contractor shall ensure that the completed subgrade is free of contaminants prior to and during the placement of pavement materials.

2.3.3

Flexible Pavement (sub-base, basecourse)

a) General

- The flexible pavement restoration shall be constructed of crushed limestone, lateritic gravel or crushed rock to match the types of materials in the existing pavement layers.
- The **classification** of the various roads on the Works shall be as determined by the relevant local authority.
- In all cases, the compacted thickness of the restored flexible pavements (sub-base and/or base course) over the sewer trench/excavation shall not be less than that of the existing pavement.
- where the existing basecourse is emulsion or cement stabilised material the Contractor shall restore the pavement using such stabilised material in lieu of crushed limestone in accordance with the local authority's specification for stabilisation.

b) Flexible Pavement Structure

The requirements of Clause 2.3.3(a) above, notwithstanding, where the trench is excavated in an existing roadway the Contractor shall choose between the following alternatives unless pavement structures have been specified by the Local Government.

i) For Main Roads/Industrial Roads/District Distributor Roads

- 330mm minimum thickness lateritic gravel (or granite road base); or
- 200mm minimum thickness limestone sub-base and 130mm minimum thickness lateritic gravel (or crushed granite) base course.

ii) For Local Distributor Roads

- 300mm minimum thickness lateritic granite or gravel road base; or
- 200mm minimum thickness limestone sub-base and 100mm minimum thickness lateritic crushed granite or gravel base course; or
- 175mm + 75mm asphalt.

iii) For Access Roads

- 200mm minimum thickness limestone; or
- 150mm minimum thickness limestone sub-base plus 100mm minimum thickness base course. (Lateritic gravel or crushed granite); or
- 175mm + 75mm asphalt

iv) For All Existing Unsealed Gravel Pavements

The restoration shall consist of a gravel pavement to match the existing material type (with a minimum thickness of 200mm) compacted to 98% modified dry density ratio in accordance with AS 1289.5.4.1.

c) Pavement Material Placement and Finishing

Before placement of any pavement material and as part of the subgrade preparation works, the sides of the remaining trench prepared for receiving the pavement material shall be cut clean to achieve a uniform plane surface, free of any loose or foreign material (including pavement materials, such as sand.)

Flexible pavement shall be made up of sub-base and base course. The base course shall be constructed of crushed rock (road base) or natural gravel. The sub-base shall be limestone, natural gravel or crushed rock according to the existing pavement.

The flexible pavement material shall be laid in layers not greater than 150mm (200mm for limestone) or less than 100mm compacted thickness, with light scarification between layers to ensure bonding.

Appropriate construction mixing methods shall be applied to ensure uniformity of the material qualities when laid and without segregation along the trench length.

The pavement shall be compacted using mechanical compactors. Hand operation to be used in confined areas, however, self propelled driven mechanical plant shall be used where trench area allows.

Sub-base pavements shall be compacted to a minimum of 95% Modified Dry Density Ratio and basecourse pavements to a minimum of 98% Dry Density Ratio in accordance with either AS 1289.5.4.1 or AS 1289.5.4.2. Where assigned values are used under AS 1289.5.4.2, the validity of the assigned Maximum Dry Density and Optimum Moisture Content shall be verified for conformance with the standard on a continual basis. Where the materials are tested are too variable to produce an assigned value complying with the limits specified

in AS 1289.5.4.2, testing shall be carried out to AS 1289.5.4.1. This standard requires the laboratory Dry Density/Moisture Content Relationship to be determined at each site tested for field density determination.

The laboratory Dry Density/Moisture Content Relationship shall be determined in accordance with AS 1289.5.2.1 with the value adjusted for the presence of any oversize materials as required by AS 1289.5.4.1.

The surface shall be in a tight and uniformly bound condition with no evidence of layering, cracking or disintegrating, and free of loose, dusty, stony or slurred areas with texture like a mosaic tile finish.

The surface shall be true to level and at any point shall not deviate by more than 10mm from a 3m straight edge.

d) Materials

i) Crushed Rock (Road Base)

Crushed rock shall be manufactured from hard, durable stone free of clay lumps, organic matter and other deleterious substances. The material may be crusher run or screened and recombined and be freshly blended prior to delivery.

When tested in accordance with AS 1289 C6.1 the particle size distribution shall comply with the limits prescribed in the following table:

| AS SIEVE SIZE (MM) | PERCENTAGE PASSING BY MASS |
|--------------------|----------------------------|
| 26.5 | 100 |
| 19.0 | 95-100 |
| 13.2 | 70-90 |
| 9.5 | 60-80 |
| 4.75 | 40-60 |
| 2.36 | 30-45 |
| 1.18 | 20-35 |
| 0.60 | 13-27 |
| 0.425 | 11-23 |
| 0.075 | 5-11 |

The ratio of the portion passing 0.075mm sieve to the portion passing 0.425mm sieve shall fall within the range of 40-60%.

Crushed rock passing the 0.425mm sieve shall have the following properties:

| | |
|--|----------|
| • Liquid limit shall not exceed | 25% |
| • Plasticity index shall not exceed | 3 |
| • Linear shrinkage shall not exceed | 2% |
| • If non-plastic, the material shall have a maximum dry compressive strength of not less than | 1700 kPa |
| • The Los Angeles abrasion loss shall not exceed | 35 |
| • The wet/dry strength variation shall not exceed | 40% |
| • Flakiness index shall not exceed | 35 |
| • The soluble sulphate salt content, expressed as percentage sulphate by mass of crushed rock shall not exceed | 0.1% |

ii) Laterite Gravel Base Course

Laterite gravel shall consist of durable laterite pebble in soil mortar. The material shall be quarried from sources approved by the Superintendent, shall not contain any roots, organic matter or other deleterious material, and shall conform to the following requirements.

a) Particle size distribution

The grading of the portion passing a 37.5mm AS sieve shall conform to the following.

| AS SIEVE SIZE (MM) | PERCENTAGE PASSING BY MASS |
|--------------------|----------------------------|
| 37.5 | 100 |
| 19.0 | 71-100 |
| 9.5 | 50-81 |
| 4.75 | 36-66 |
| 2.36 | 25-53 |
| 1.18 | 18-43 |
| 0.425 | 11-32 |
| 0.075 | 4-19 |

b) Soil constraints

The portion of the sample passing the 0.425mm sieve shall conform to the following:

- i) Liquid Limit - not greater than 25%;
- ii) Plasticity Index shall not exceed 3;
- iii) Linear Shrinkage - not greater than 3%;
- iv) Maximum Dry Compressive Strength (MDCS) - not less than 1700 kPa; and
- v) California Bearing Ratio (CBR) - not less than 80%

Where required by the Superintendent, the material shall have a 4 day soaked CBR

value of not less than 80% for a specimen compacted to 98% modified dry density ratio in accordance with AS 1289.5.4.1 at or near its optimum moisture content.

iii) Crushed Limestone Rubble Sub-base Material

The crushed limestone rubble shall be obtained from an approved source, and shall be free from sand, roots and other foreign material, and shall not contain either oversize spalls or capstone or an excessive proportion of fine grained material.

The percentage of wear of the crushed limestone, determined by the Los Angeles test, shall not exceed 60% or be less than 20%.

The calcium carbonate content of the crushed limestone shall not be less than 70% nor in excess of 85% by mass when chemically tested with hydrochloric acid.

The maximum dry compression strength of the limestone shall not be less than 1700 kPa.

The crushed limestone for sub-base shall comply with the following grading requirements when tested in accordance with AS 1289 C6.1:

| SIEVE SIZE (SQUARE OPENING AS SIEVE) | PERCENTAGE PASSING BY MASS |
|--------------------------------------|----------------------------|
| 75mm | 100% |
| 19mm | 60-80% |
| 2.36mm and less | 20-40% |

Sampling and testing of crushed limestone rubble shall be in accordance with AS 1141.

A sample shall be taken and tested by the Contractor for calcium carbonate content, percentage of wear, grading and determination of the maximum dry density of the material.

If the material varies in quality or is obtained from various quarries, each variation in quality, or, material from each quarry used shall have this test performed by an approved NATA Testing Authority and a record shall be maintained by the Contractor as to where the various materials have been placed.

e) Sampling and Testing Sub-Base and Base Course Material

At the commencement of production or supply of sub-base and base course material the Contractor shall take two representative bulk-samples from the first 50 tonne of each material. During placement, the Contractor shall take at least one representative bulk-sample of the material from each successive 200 tonne of material from each source and intended for delivery to the Site.

The bulk-samples shall be taken in accordance with the requirements of AS 1141.3.

For the material in each bulk-sample of material obtained in accordance with the requirements specified, the Contractor shall determine each of the properties detailed in the preceding paragraphs for the sub-base and base course material. Test results shall be submitted to the Superintendent for approval.

Any material which would break down with ageing or weathering to such an extent that it would then fall outside the limits of the Specification, shall be rejected.

2.4 WEARING COURSE

2.4.1

General

All priming and binder application operations shall be undertaken by use of approved truck mounted spray equipment.

The application of primer and binder by hand lance will be limited to areas considered impracticable to be treated by truck mounted sprayers.

All works adjacent to the spraying operations (including concrete kerbs, brick paving etc). shall be protected by appropriate covers. All entries to drainage structures shall be blocked to prevent entry of bitumen. Drip trays shall be placed under spray bars when sprayer is stationary.

Records of all spray application rates shall be forwarded to the Superintendent within seven (7) days of application.

2.4.2

Wearing Course Structure

The surface wearing course shall be one of the following alternatives:

- gravel (for gravel pavement);
- prime (or primer seal) and bituminous spray seal;
- prime (or primer seal) and asphaltic concrete seal;
- emulsion tack coat and thicklift asphaltic concrete;
- two coat seal; or
- concrete.

a) Existing Wearing Course - Gravel

The restored gravel surface shall match the existing surface material.

b) Existing Wearing Course - Spray Seal

The new surface-spray seal shall match the pre-existing seal type for each road.

c) Existing Wearing Course - Asphaltic Concrete

Where the existing surface is asphaltic concrete seal, the minimum wearing course for restoration shall be as follows:

i) **For Main Roads/Industrial Roads/District Distributor Roads**

- Straights;
Prime plus 30mm minimum thickness, 10G, 75 blow asphaltic concrete.
- Major Intersections;
Prime plus 40mm minimum thickness, 14G, 75 blow asphaltic concrete.

ii) **For Local Distributor Roads**

- Prime plus 30mm minimum thickness, 10G, 50 blow asphaltic concrete.

iii) **For Access Roads**

- On limestone pavement -
50mm minimum compacted thickness 14G, 50 blow asphaltic concrete.
- On roadbase base course -
Prime plus 25mm compacted thickness 7G, 50 blow asphaltic concrete.

Road surface remedial works, shall be carried out by the Contractor in addition to the wearing courses specified above, in accordance with the technical specification as published by the IPWEA and AAPA.

Driveway crossings damaged by the excavation works shall be reinstated to Clause 2.7 requirements.

2.4.3

Priming

a) Authority to commence priming

Priming shall not be undertaken until the pavement has been inspected by the Superintendent (in the company of the Local Government inspector).

b) Application

Priming shall not be carried out during inclement weather conditions and the prepared base course shall be sufficiently dry.

Before priming, the edges of the existing wearing course shall be uniformly and vertically cut (sawn) on both sides over the entire length of the trench. Wherever practical the sawn cut shall be parallel to the trench being prepared for pavement restoration. The asphaltic concrete edges shall be profiled. All areas of intrusion/overlap into the adjoining pavement shall be cut to a rectangular shape.

The sections of undamaged existing road-way surface, between the areas of trench intrusion into the existing surface, which are less than 2.0m in length, shall be removed to allow continuous rectangular sections of primed surfaces.

The edges of existing sprayed seal shall be prepared in accordance with the requirements for the sprayed seal specification. The resultant edges shall adhere properly and uniformly with the underlying pavement and be uniform in line, with deviations along a 3m straight edge of no more than 40mm.

The pavement and adjacent existing seal to 500mm width shall be broomed free of all loose material and dust, and any defects are to be made good. The prime shall be applied to a slightly dampened flexible pavement.

The primer shall be applied at a rate of 1.2 litres/m² to the approved surface course for its full width with an overlap to the adjacent existing seals of 25mm.

The primer shall be a cutback primer consisting of 50% residual bitumen and 50% power kerosene or, should weather conditions preclude the use of cutback primer, the Superintendent may approve a 60/40 cationic bitumen emulsion applied at a rate of 1.5 litres per square metre, measured at a temperature of 15 degrees Celsius. The cutback primer shall be applied at a temperature of 60 degrees Celsius. Emulsion primer may be heated to a maximum temperature of 50 degrees Celsius if conditions warrant.

c) Blinding

For cutback primer apply sand or 1.5mm aggregate after penetration of the primer but while sufficient bitumen is on the surface to allow adhesion. Sand or aggregate shall be applied at a sufficient rate to prevent lifting of the primed surface by vehicles.

For emulsion primer the blinding shall be a nominal 7mm aggregate applied immediately after spraying at a rate not less than 1 cubic metre per 150 square metres and sufficient to prevent lifting of the primed surface by vehicles.

The surface is to be multi-tyre rolled until the aggregate is firmly embedded in the primer.

The surplus aggregate shall be swept up and removed from Site not less than seven days after the completion of the rolling.

d) Protection of primed surface

The Contractor shall suitably protect the primed surface from excessive wear prior to the application of the surface seal. All damaged areas of prime shall be repaired without loss of integrity of the surrounding prime.

2.4.4

Bituminous Spray Seal (Single Coat)

The sprayed seal shall be a single coat hot bitumen seal Binder class 170 bitumen with the following properties:

| PROPERTY | 14MM AGGREGATE SEAL | 10MM AGGREGATE SEAL |
|--------------------------------------|-----------------------------|---------------------------|
| Binder Mix (Bitumen: Cutter) | 98:2 | 98:2 |
| Anti-Stripping Agent | 0.2% | 0.2% |
| Bitumen Minimum Application rate hot | 1.6 litres/L/m ² | 1.4 litres/m ² |
| Aggregate Size | 14mm | 10mm |

The aggregate size shall match that of the existing road surface seal (as closely as possible).

The bitumen application rate and properties shown above are a guide only. The actual spray rates are subject to the average least dimension characteristics of the aggregate, the type of surface to be sprayed and traffic volumes for the street section. Details of the physical properties of aggregate to be used shall be submitted by the Contractor at least 10 days prior to spraying.

Spraying shall not take place during rain or when rain appears imminent. Bitumen shall be applied by spray bar or hand lance by a skilled experienced operator only when it is impractical to utilise a spray bar.

Precoated cover aggregate shall be applied uniformly immediately following spraying, and one pass with steel roller first and then rolled with rubber rollers to ensure full embedment and adhesion. Any stripping, flushing etc shall be remedied by the Contractor, at the discretion of the Superintendent in consultation with the local authority.

Care shall be taken to ensure a smooth, neat finish.

The new sprayed seal shall overlap the existing seal by 300mm.

All excess aggregate shall be swept up and removed from Site not less than seven days after the completion of the rolling.

2.4.5

Two Coat Seal

The seal shall consist of a two coat emulsion seal, as specified below. The bitumen application rate and properties shown above are a guide only. The actual spray rates are subject to the average least dimension characteristics of the aggregate, the type of surface to be sprayed and traffic volumes for the street section.

Details of the physical properties of aggregate to be used shall be submitted by the Contractor to the Superintendent at least 10 days prior to spraying.

a) Materials

i) Binder

Binder shall consist of cationic bitumen emulsion conforming with the relevant Australian Standard.

ii) Aggregate

14mm and 7mm aggregates shall be crushed granite free of dust, clay, excessive moisture and other deleterious substances.

Aggregate shall be crushed from hard, sound durable rock. The percentage loss as measured by the Los Angeles Abrasion Test shall not exceed 30.

Particle size distribution shall be within the limits prescribed in the following table for the nominal size specified.

| AS SIEVE SIZE (MM) | PERCENTAGE PASSING BY MASS | |
|--------------------|----------------------------|--------|
| | 14MM | 7MM |
| 19.0 | 100 | - |
| 13.2 | 95-100 | - |
| 9.5 | 0-30 | 100 |
| 6.7 | 0-5 | 85-100 |
| 4.75 | - | 0-40 |
| 2.36 | - | 0-10 |
| 0.600 | 0-2 | 0-2 |

Average least dimension of aggregates shall comply with the requirements of the following table for the nominal size specified.

| SEAL - COAT | NOMINAL SIZE (MM) | ALD (MIN) (MM) |
|-------------|-------------------|----------------|
| First Coat | 14 | 6.4 |
| Second Coat | 7 | 3.5 |

All aggregates shall be free of excess dust, and the Superintendent may order the washing and/or precoating of dusty aggregate.

b) Plant

i) Spraying equipment

Spraying equipment shall comply with the requirements of the AUSTRROADS ‘Specification for Performance Requirements for Mechanical Sprayers of Bituminous Materials’.

Unless otherwise permitted, the sprayer shall have a minimum tank capacity of 2000 litres.

When requested by the Superintendent, provide a current certificate and calibration chart issued by the Main Roads, Western Australia before commencing spraying operations.

ii) Rollers

A self-propelled static pneumatic rubber tyred roller of approximately 15 tonnes mass shall be used.

Steel rollers, vibrating rollers and drawn rollers of any type shall not be used for sealing work.

iii) Trucks

The tipper trucks shall be fitted with approved tail-gate mounted metal spreaders.

c) First Coat

The emulsion application rate shall be confirmed by the Contractor 7 days prior to commencement. Unless otherwise directed by the Superintendent an application rate of 1.4 litres/m² (measured at 15 degrees Celsius) and 80m²/m³ of 14mm nominal size aggregate shall be adopted by the

Contractor. The Contractor shall confirm the application rate with the Superintendent a minimum of seven (7) days before proceeding with this work.

When the flexible pavement has been compacted, trimmed and approved, the Contractor shall sweep the surface with a suitable rotary broom to remove dust and debris and until a mosaic of well embedded stone is showing on the surface. Areas inaccessible to the mechanical broom shall be swept by hand.

No traffic shall be allowed on the broomed surface.

The Contractor shall notify the Superintendent at least 24 hours in advance of intention to spray.

Before work commences weather conditions shall be dry and reasonably calm. The pavement temperature shall be not less than 15 degrees Celsius.

The pavement shall be lightly watered so that the surface is damp, but not wet. In the event of excess water being applied, bitumen spraying shall not proceed until the surface has dried and been recompactd to the satisfaction of the Superintendent.

The Contractor shall protect all works in the vicinity of spraying operations. Concrete kerbs, brick paving, etc, shall be covered with sand, building paper or bags. The Contractor shall place drip trays under spray bars when sprayer is stationary.

Immediately after the emulsion has 'broken', the Contractor shall spread 14mm aggregate on the binder. The aggregate shall be adequately rolled with a rubber tyred roller. Any areas of binder not covered with aggregate from the metal spreaders shall immediately be covered manually. During the rolling process, the drag broom shall be used to ensure an even spread of aggregate.

d) Second Coat

The second coat may, unless specified otherwise, be placed immediately after the first.

Emulsion application rates shall be confirmed by the Contractor prior to commencement. Unless otherwise directed by the Superintendent an application rate of 2.0 L/m² (measured at 15 degrees Celsius) and 120 m²/m³ of 7mm nominal size aggregate shall be adopted by the Contractor. The Contractor shall confirm such application rate with the Superintendent a minimum of seven (7) days before proceeding with this work.

Prepare the surface by sweeping with the drag broom to ensure an even spread of the aggregate placed in the first coat.

Protect all works in the vicinity of spraying operations. Concrete kerbs, etc, shall be covered with sand, building paper or bags. The entries to drains and sumps shall be closed.. Drip trays shall be placed under spray bars when sprayer is stationary. (Kraft paper shall be used to ensure that all joins are neat and straight.)

The Contractor shall not commence sealing until the road surface temperature has reached 15 degrees Celsius.

Immediately after the emulsion has 'broken' the Contractor shall cover the binder with 7mm aggregate. Binder which is not covered by aggregate from the metal spreader shall be covered manually. The area shall be rolled with pneumatic tyred roller with tyre pressures adjustable in the range 550 kPa to 700 kPa.

The minimum amount of rolling shall be at a rate of 4 roller hours per 4,500 litres of bitumen sprayed and the following conditions shall apply:

- i) the whole of the area shall have received at least one roller pass within 2 minutes of covering;
- ii) after the initial slow pass by the pneumatic tyred roller the speed of rolling shall be increased to the minimum practicable for the area being sealed;
- iii) at least 25% of the rolling shall be applied within 2 hours of covering;

- iv) at least 50% of the rolling shall be applied within 4 hours of covering;
- v) the whole of the rolling shall be completed within 3 days of covering;
- vi) the rolling shall be carried out between the hours of sunrise and sunset; and
- vii) at the time of rolling, excess aggregate shall be removed and/or additional aggregate applied as required. The surface shall be drag broomed until it is uniformly covered with aggregate thoroughly embedded in the binder.

When the aggregate has been evenly spread and embedded in the binder, any remaining loose particles from the pavement shall be removed.

e) Acceptance

i) General

Acceptance of sealed surfaces shall be subject to the availability of certified test results and quality certificates for the work carried out.

ii) Tolerances

Actual rate of application of binder shall be in the range of 95% to 105% of the ordered rate.

iii) Defective Work

If the actual rate of application of binder is less than 95% or more than 105% of that ordered, the surface shall be resealed as directed by Superintendent (after removal of the previously sprayed seal as necessary, at the discretion of the Superintendent).

In any case, all unravelled, stripped slick or fatty surfaces shall be repaired as directed by the Superintendent.

2.4.6

Asphaltic Concrete

Asphaltic concrete works are to be carried out as per Technical Specification "Tender Form and Schedule

for Supply and Laying of Asphalt Road Surfacing" published by the Institute of Public Works Engineering, Australia.

2.4.7

Concrete

Unless otherwise specified, concrete pavements shall be reinstated using class N25 concrete to minimum 100mm thickness, or the original concrete pavement thickness, whichever is the greater, on approved subgrade.

The surface finish of the concrete shall be as close as practical to the existing, in both colour and texture.

Additional concrete beyond the damaged area shall be removed and replaced back to the nearest existing joint even if undisturbed by the sewer trench works.

Concrete shall be cured for 72 hours using PVC sheeting weighted with wet sand. All sand and plastic shall be removed from Site on completion of curing.

2.4.8

Remedial Works for Damaged Road Surfaces

a) When Existing Wearing Course is less than Ten Years Old

i) 75% Lane Disturbance

If the width of the trench and trench intrusions into existing pavements (including the adjacent seal overlaps) is greater than 75% of road lane width then the whole of the road lane width shall be resurfaced to match the existing road surface. A road lane refers to half of unmarked roadways or the width of marked lanes.

ii) Greater than 50% Roadway Disturbance

Where the trench disturbance is greater than half the total road width then the whole road shall be seal/resealed in accordance with

Clause 2.4.4 after the appropriate wearing course restoration over the trench.

**b) All Existing Road Surfaces
(irrespective of age)**

i) Reseal of Undamaged Seal Against Kerbs

In the case of trenching in the roadway, where an existing section of roadway of maximum 1.0m width remains undamaged against kerbs, resealing shall occur over both the trench and this undamaged section of roadway using a spray seal in accordance with Clause 2.4.4, after the appropriate wearing course restoration over the trench.

ii) Damage To Existing Adjacent Road and Driveway Crossing Surfaces

The adjacent road surfaces shall be appropriately protected from damage from the likes of construction vehicles, placement of manhole sections, excavated rock indentations etc.

Where damage occurs to the existing road/driveway surface, ie. gouges, scrapes or potholes; the contractor shall repair the surface to previous condition.

The repair may involve the spraying of a reseal (in accordance with sealing requirements of Clause 2.4) of the entire road pavement (lane) or resurfacing of the entire driveway crossing area as appropriate and at the discretion of the Superintendent in consultation with the Local Government.

Only Asphalt Hotmix (minimum compacted thickness of 25mm) will be accepted as a suitable patching material, (where a pre-patching material and sprayed reseal and sprayed reseal is required).

iii) Parallel Cracking

Where parallel cracking of the existing road surface occurs along the edge of a trench then the reinstatement shall be widened both to a line 200mm beyond the extremity of the cracking and so as to produce a consistent width of restoration.

c) Finished Pavement Grades

Unless otherwise approved by the Superintendent, the Contractor shall complete an As Constructed survey of the existing wearing surface at 10m intervals and low points along the entire extent of road affected by the utility infrastructure trenching. This shall be forwarded to the Superintendent for information. The Contractor shall reinstate to the As Constructed levels. Notwithstanding this requirement the Contractor shall adjust finished pavement levels locally to ensure the road is free draining as there may be locations in flat roads where previous consolidation has created undrained areas isolated from the main drainage points.

d) Damaged Concrete Pavements

If excavation damages existing concrete pavements including paths and crossovers the damaged concrete shall be removed back to the nearest control joint and replaced to match the existing pavement in accordance with Clause 2.4.7 of the specification.

2.4.9

Reinstatement of Road Markings and Signs

a) When a Stop/Holding line is removed the Contractor shall immediately inform the Main Roads WA Faultline on 1800 800 009 in the Metropolitan or South West Regions of the details and location of the lines removed. The Contractor shall inform the Main Roads Regional Office if the works are in other Regional areas (refer to the Utility Providers

Code of Practice (2002) Appendix A for contact details). Stop signs shall not be removed unless approved by the Superintendent.

- b) Immediately upon completion of road pavement restoration the Contractor shall install temporary Stop and Holding lines in the location of the lines they have removed. 3M temporary tape (or similar) is to be used for the lines. The width of the temporary line is to be a minimum of 150mm wide, and it is to be placed in accordance with Main Roads WA standard.
- c) Immediately upon restoration of the road pavement wearing course the Contractor shall reinstate all road line markings that have been removed by the works under the Contract, by arrangement with Main Roads WA. Any signs damaged or removed in carrying out the works shall be replaced immediately by the Contractor.

2.5 PAVEMENT TESTING AND INSPECTIONS

2.5.1

General

The Contractor shall supply copies of all test certificates to the Superintendent and the Local Government within seven (7) days of testing on Site.

All testing for subgrade, sub-base, basecourse and wearing course layers shall be carried out by a NATA registered testing laboratory as approved by the Superintendent.

The Contractor's NATA registered testing authority shall be a completely independent firm and/or entity to that of the firm involved in the laying of the pavement and/or wearing course layers.

Payment for NATA registered testing of pavements and wearing courses as specified (not including penetrometer testing) shall be made only for the successful tests in the accepted final group of tests certifying a completed Test Lot of works.

The Contractor shall advise the Superintendent and the Local Government that a section of reinstatement work area is ready for inspection with a minimum of one (1) working days notice at the following key times:

- on completion of trench backfill, (prepared subgrade) prior to placing pavement;
- on completion of pavement prior to primer application and;
- on completion of primer application, and prior to application of seal/wearing course.

2.5.2

Compaction Testing Equipment

The Perth Sand Penetrometer calibrated to correlate with the required density shall be used for testing subgrade compaction.

For flexible pavement layers, nuclear density meters shall be used for compaction testing, with a maximum modified dry density test completed for each test point. For gravel basecourse material an assigned value for the Modified Dry Density Ratio may be used provided the material is uniform in a nature and complies with AS 1289 Clause 5.4.2.

a) Trench/Excavation Backfill Compaction

Compaction of backfill in trenches/excavations and around new and existing structures:

Compaction testing of backfill material shall be done along the length of the trench or excavation for a maximum of 15m. Compaction testing around junction pits and access chambers shall be done at least one on each side.

b) Subgrade Compaction

Subgrade shall be compaction tested at a minimum rate of one test per 30 linear metres and one test for each section between structures less than 30m apart under pavements. Particular emphasis on testing will be made to ensure that adequate compaction has been achieved around structures.

The above notwithstanding, a minimum number of 3 tests shall be carried out for each Test Lot.

**c) Base Course/Sub-base Course
Compaction**

The base course and sub-base shall be compaction tested at the minimum rate of one test per 50 linear metres and one test for each section between structures less than 50m apart.

The above notwithstanding, a minimum number of 3 tests shall be carried out for each Test Lot.

d) Asphaltic Concrete

Audit core tests of the asphaltic concrete wearing course may be undertaken by the Superintendent to determine Marshall density/stability, thickness of asphalt course, bitumen content and percentage air voids.

Samples may be taken as required and tests carried out by a NATA registered laboratory, on behalf of the Superintendent.

2.5.4

Reporting of Test Results

Copies of test result certificates (both failed and successful) for each appropriate test lot, shall be submitted to both the Superintendent and the Road Authority by the Contractor within seven (7) days of testing of each Test Lot. Satisfactory completed submissions in this regard shall be pre-requisites to the works being deemed complete and due for payment. Test results for each penetrometer testing shall include the number of blows per 300mm penetration in that specific material equivalent to the relevant specified modified maximum density ratio compaction requirement in each case.

2.5.5

Acceptance of Pavements - Remedial Works

Should any Contractor's testing and re-testing or Superintendent's audit testing of pavement Test Lots

reveal a single test that fails then further working (including scarifying, remixing and/or compaction as necessary) shall be carried over of the entire Test Lot and retests carried out, all at the Contractor's cost. Re-testing shall be carried out at the same frequency as the original testing.

2.5.6

Acceptance of Asphaltic Concrete Wearing Course – As per specification of IPWEA/AAPA

Areas of asphaltic concrete assessed as defective with respect to the requirements specified herein for mix quality, density, percentage voids, surface finish, surface smoothness, or thickness, shall be removed and replaced by the Contractor, at the discretion of the Superintendent.

The Contractor shall remove and replace areas of asphaltic concrete which show signs of either ravelling, fretting, cracking, deflection, subsidence, scabbing or instability, for any reason, at the discretion of the Superintendent.

Any bituminous mix that has become damaged or contaminated with foreign material shall be removed and replaced.

The extent of the defective area shall include all the asphaltic concrete works in that Test Lot containing the failed test(s) unless defective areas can be suitably isolated to the Superintendent's satisfaction by additional testing (where necessary) by the Contractor.

Any subsidence of restored areas shall be repaired by the Contractor within two (2) days of the occurrence and/or notification of the defect. Immediate repairs shall be carried by the Contractor out as necessary to maintain the safety of the Site to the satisfaction of the Superintendent otherwise the Local Government shall be authorised to carry out remedial works at the Contractor's cost.

Skin patching of an area that has been rolled shall not be permitted.

Defective areas shall be removed and replaced with fresh materials. Patches shall be prepared by cutting and removing the defective asphaltic concrete to the full depth of the course such that the sides of the area are at right angles or parallel to the direction of traffic and the edges are vertical. The internal edges and surfaces of the area to be patched shall be cleaned of all cutting residue by flushing with water, and all free water removed. The surfaces shall be tack coated with bituminous emulsion prior to placing of fresh material which shall be spread, compacted and finished in accordance with the Specification. Surface reseal (sprayed seal) shall also be carried out as necessary to match the existing surface.

2.6 EXTRUDED KERBING

2.6.1

Scope

Where existing kerbing is demolished or damaged during the course of the work under the Contract, the supply and laying of replacement extruded concrete kerbing shall be carried out using a kerb section to the Local Government's standards.

2.6.2

Experienced Personnel

All works under this Section shall be carried out by personnel experienced in the laying of extruded concrete kerbing.

2.6.3

Concrete

Concrete for use in extruded kerbing shall be ready mixed concrete complying with all requirements of AS 1379.

The aggregate size shall be 10mm nominal. The concrete cylinder compressive strength at 28 days shall be not less than 25MPa.

A kerbing machine shall be used. Concrete shall have a maximum slump of 50mm.

2.6.4

Line and Level of Work

The kerbing shall be relayed to match pre-existing alignment level and grades.

The construction tolerance shall be such that when a 3 metre long straight edge is laid on the top or face of the kerb, the surface shall not vary more than 3mm from the edge of the straight edge, except at grade changes or curves. Kerbs shall be equal distance from the road centreline (± 10 mm).

2.6.5

Construction Details

The surface to receive the kerb shall be a fully compacted and sealed base course.

The Contractor shall prepare the surface by removing all loose material to the satisfaction of the Superintendent immediately prior to the placing of the kerb.

The Contractor shall give the Superintendent 24 hours prior notice of the start of the kerb laying operations in order that the Superintendent may have the opportunity of inspecting the work.

The extruded kerb shall be finished with the use of an overall steel trowel whilst the concrete is still comparatively wet to give a smooth finish free of surface pits and depressions.

Expansion joints shall be provided at every second contraction joint and shall be sawn vertically at right angles to the longitudinal line of the kerb, to give a 12mm to 10mm wide cut for the full section of the kerb, after the concrete has cured.

Expansion joints shall be provided at all tangent points adjacent to inlet structures and when abutting new works to existing kerb.

The expansion joints shall be spaced at maximum 6.0m intervals, sealed with a closed cell polymer backing rod to a depth of 25mm to act as a backing and elastomeric silicon sealant. The seal shall finish 3mm below the face of the kerb.

Contraction joints shall be inserted immediately after the final finishing and shall be located at 1.5m intervals and shall be formed with a grooving tool, not fully fitted through the section of the kerb. Alternatively, the joint may be formed by cutting a 5mm gap at least 2/3 the depth of the kerb section.

All joints where cutting is required, shall be cut not less than 24 hours following the laying of that section of kerb.

2.6.6

Curing

Curing compounds shall meet ASTM C309 requirements.

Kerbing shall be treated with a sprayed application of "Calcure D" membrane curing compound applied at a minimum rate of one litre per 6 square metres, within two hours of surface finishing of the concrete. The compound shall be applied by means of a low pressure mechanical spray. An approved equivalent curing compound may be used.

In hot weather, after the application of the curing compound, the kerb shall be covered with an approved Polythene membrane for a minimum period of 4 days prior to any road materials being placed adjacent to the kerb.

The membrane shall be replaced on completion of cutting and jointing operations.

2.6.7

Continuation of Roadworks

No further work shall be done on the roadworks or backfilling adjacent to kerb laid until a minimum of four (4) days following laying of kerb. Any

damage to the kerb by the Contractor shall be made good by complete replacement of the damaged section between joints.

2.6.8

Protection of Works

The Contractor shall be held solely responsible for the replacement as necessary of any defective or damaged kerbing during the course of the works and for the maintenance period as specified.

2.6.9

Buttressing of Kerb

Fill shall be placed not sooner than four (4) days after kerbing construction and thoroughly compacted by a plate compactor for the full length of the kerb and for a width of 600mm from back of kerb to give final verge level to the top of the kerb.

2.7 DRIVEWAY CROSSINGS AND CONCRETE/BRICK PAVING

2.7.1

Asphaltic Concrete/Sprayed Seal/Gravel Surfaces

The driveway crossings shall be restored as for road pavement restoration (classification: Access Ways) in the case of existing asphaltic concrete, sprayed seal and gravel surfaces. When the excavation damages any part of the existing driveway crossover the full width of the damaged section parallel to the roadway shall be reconstructed in the accordance with Clause 2.7 of the Specification. Where the damage is greater than 50% of the driveway area then the whole driveway shall be resurfaced to match the existing driveway surface levels and material type. (The existing wearing course shall be removed as necessary). Sprayed seal shall be a two (2) coat seal in accordance with Clause 2.4.5.

Where a strip of undisturbed driveway remains which has a width of less than 700mm at any position along its length then the wearing course

strip shall removed and the area incorporated in the new wearing course restoration works.

2.7.2

In situ Concrete Surface

Refer to the requirements of Clause 2.4.7 of the Specification.

2.7.3

Clay Brick/Concrete Block Paving on Roadways and Driveway Crossings

For paved driveway crossings and roadways the pavement layers should be adjusted to provide a 200mm compacted thickness of base course below a 30mm (+5mm) thick compacted sand bedding layer plus the pavers (as per existing) to match the levels of the existing undamaged surrounding surfaces.

The base course layer shall be compacted to 98% modified dry density ratio in accordance with AS 1289.5.4.1.

The bedding sand shall be a well-graded sand passing a 4.75mm sieve and suited to concrete manufacture.

The grading limits are:

| AS SIEVE SIZE | PERCENTAGE PASSING |
|---------------|--------------------|
| 9.52mm | 100 |
| 4.75mm | 90-100 |
| 2.36mm | 75-100 |
| 1.18mm | 55-90 |
| 600um | 35-59 |
| 300um | 8-30 |
| 150um | 0-10 |

The bedding shall be free of deleterious soluble salts or other contaminants likely to cause efflorescence or lead to reduced skid resistance. Bricklayers sand and single sized dune sands are not suitable.

The paving units shall be compacted after laying to achieve consolidation of the sand bedding and brought to appropriate finished levels and profiles by not less than three (3) passes of a suitable plate compactor.

Compaction should proceed as closely as possible following laying and prior to use by traffic. Paving work shall be carried out by proven specialised and skilled tradesman in this field of work.

2.8 STORMWATER DAMAGE

2.8.1

General

Should disturbance or demolition of existing drainage lines and structures occur due to the trench works they shall be reinstated in accordance with the specification to be obtained by the Contractor from the Local Government.

The Contractor shall also comply with construction drawings for precast concrete pits obtained from the Local Government.

Where existing grated pit concrete surrounds are cracked prior to commencement of work and further damage results to the pit surround as a result of the Contractor's work, the Contractor shall replace the entire concrete surround.

2.8.2

Pipes and Precast Components

All pipes and precast components incorporated in the restoration works shall be in first class condition and free of cracks, chips and deformities. Any items damaged by the Contractor shall be rejected, removed from the Site and replaced with new materials.