

South Africa

**COTO**

Committee of Transport  
Officials

# **Standard Specifications for Road and Bridge Works for South African Road Authorities**

**Draft Standard (DS)**

## **CHAPTER 7: MAINTENANCE AND REPAIR OF CONCRETE LAYERS**

**October 2020**

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## FOREWORD

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### Existing publication:

The new COTO Standard Specifications for Road and Bridge Works for South African Road Authorities was approved by COTO on 18 August 2020 as a Draft Standard (DS) and will be replacing the COLTO Standard Specifications for Road and Bridge Works for State Road Authorities (1998 Edition).

Existing contracts and tenders in the design phases based on the COLTO Standard Specifications (1998 Edition) will remain unaffected but will be phased out during the next 6 months and the COTO Standard Specifications (2020 Edition) will be mandatory for use in procurement documents advertised as from 1 March 2021.

### Document versions:

**Draft Standard (DS).** The Draft Standard will be implemented in industry for a period of two (2) years, during which written comments may be submitted to the COTO subcommittee. Draft Standards (DS) have full legal standing.

**Final Standard (FS).** After the two-year period, comments received are reviewed and where appropriate, incorporated by the COTO subcommittee. The document is converted to a Final Standard (FS) and submitted by the Roads Coordinating Body (RCB) to COTO for approval as a final standard. This Final Standard is implemented in industry for a period of five (5) years, after which it may again be reviewed. Final Standards (FS) have full legal standing.

### Comments:

Comments on the Draft Standard Chapters should be provided in writing on the Excel spreadsheet provided on the websites mentioned below and e-mailed to [cotorevision@nra.co.za](mailto:cotorevision@nra.co.za).

### Please note:

This document and its various Chapters will only be available in electronic format.

The Draft Standard (DS) Chapters will be made available for download on the South African National Roads Agency SOC Ltd (SANRAL) and Department of Transport websites.

August 2020 version replaced with October 2020 version due to amendments to Chapters.

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# CHAPTER 7: MAINTENANCE AND REPAIR OF CONCRETE LAYERS

## 7.1 REPLACEMENT OF EXISTING JOINT SEALANT

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## A7.1 REPLACEMENT OF EXISTING JOINT SEALANT

### PART A: SPECIFICATIONS

#### A7.1.1 SCOPE

This Section covers work related to:

- The removal and replacement of existing joint sealants in concrete pavements where no repairs to the adjacent concrete is required.
- Joint sealant installed under a Performance Based System with extended warranties is covered under Part D of this Chapter.

#### A7.1.2 DEFINITIONS

The definitions relating to concrete layers as stated in Chapter 6 shall also be applicable to this Chapter 7.

**Joint sealants** - cold poured self-levelling silicone liquid sealant for sealing joints in concrete.

**Types of joints and associated pavement distress** - as defined in the latest version of TMH9: Standard Visual Assessment Manual, Part C: Concrete Pavements.

#### A7.1.3 GENERAL

The existing joint sealant shall be removed and the joint shall then be reamed, cleaned and the new sealant installed in accordance with the Contract Documentation.

The Contractor shall submit a complete method statement for approval by the Engineer before the resealing of any joints commences. The Engineer will have 5 days to study and comment on the method statement before approval shall be given.

#### A7.1.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

Unless prescribed as part of a performance guarantee system as specified in Part D, the joints shall be formed and sealed in conformance to the specified requirements in Clause A6.1.5 of Chapter 6 and Chapter 7 as applicable.

#### A7.1.5 MATERIALS

##### A7.1.5.1 Sealant

The joint sealant shall be a cold poured self-levelling liquid silicone sealant conforming to the requirements as prescribed in Clause A6.1.5.7 of Chapter 6 for the particular type of sealant specified.

## **A7.1.6 CONSTRUCTION EQUIPMENT**

The equipment required shall be appropriate to the work to be completed in accordance with the prescribed requirements and construction tolerances permitted.

## **A7.1.7 EXECUTION OF THE WORKS**

The execution of the work shall be as specified below for the various types of treatments listed:

### **A7.1.7.1 Removal of existing seals, reaming of joint and resealing**

The reaming and sealing of existing joints shall be undertaken in accordance with Clause A6.1.7.5. In addition, this treatment is applicable where existing joints are only slightly spalled and no treatment of the adjacent concrete is required. The existing joint seals and backing material shall be removed from the joints. The joint grooves shall be reamed to their prescribed final dimensions. They shall then be cleaned by means of a high pressure jet of water over the full depth of the joints to remove all fine matter and to produce dust-free joint grooves. Immediately before the supporting material is installed, the grooves shall be dried by means of oil-free compressed air at a pressure of 700 kPa. Compressors shall be equipped with an apparatus which removes water and oil from the compressed air. Where a primer is required by the manufacturer, it shall be applied before the backing materials are installed.

After the joints have been finally cleaned and the primer (if any) has been applied, a supporting backing cord shall be installed by means of an approved rolling tool in the prescribed positions. Where the joints are dirty, wet or moist, the supporting material shall be removed, the joints cleaned and dried, and fresh material applied.

The silicone sealant shall be pumped continuously directly into the joints with a suitable pneumatically driven pump. Sealing shall be done from the upper surface of the supporting material. Immediately after installation and before a skin appears, the surface of the sealant shall be worked to compact the sealant and to press it against the sides of the joint so as to ensure that the prescribed clearance under the road surface is obtained. As an alternative to separate installation and finishing of the sealant, an approved injection nozzle incorporating a finishing apparatus may be used, in which case only closed-cell polyethylene may be used as supporting material. Further directions supplied by the manufacturer shall be strictly complied with, particularly with regard to temperatures for application, opening to traffic, and safety aspects. No traffic shall be permitted to pass over a sealed joint before the sealant is able to withstand the penetration of foreign matter.

The procedure(s) to be followed by the Contractor to prevent the sealant from being spilt onto the concrete pavement shall be subject to approval by the Engineer. All surplus sealant and other foreign matter shall be removed from the concrete pavement surface in accordance with the directions of the manufacturer of the sealant.

Seals shall only be removed immediately prior to the resealing operation and no sections of pavement shall be left unsealed while being trafficked unless written permission has been obtained from the Engineer.

### **A7.1.7.2 Bevelling of spalled edges and resealing**

This treatment shall apply to joints spalled to degrees of medium and high severity as defined in TMH 9. Existing seals shall be removed and the joints reamed out to produce clean-cut surfaces as described in Clause A7.1.7.1 above. The edges of the joints shall then be bevelled by means of a mechanical device to dimensions of 10 mm, 15 mm or 20 mm (dependant on the depth of the spall) at a 45° angle before the installation of the liquid sealant as described in Clause A7.1.7.1.

## **A7.1.8 WORKMANSHIP**

### **A7.1.8.1 Groove width**

After reaming, the width and depth of the groove shall be  $\pm 0,5$  mm of that width specified in the Contract Documentation.

### **A7.1.8.1 Sealant depth**

The top surface of the sealant shall not be less than 5,0 mm and not more than 7,0 mm below the paved surface.

# **B7.1 REPLACEMENT OF EXISTING JOINT SEALANT**

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<b>B7.1.8</b>	<b>WORKMANSHIP</b>

### **B7.1.1 SCOPE**

The provisions of Part A shall apply.

### **B7.1.2 DEFINITIONS**

The provisions of Part A shall apply.

### **B7.1.3 GENERAL**

The provisions of Part A shall apply.

### **B7.1.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

The provisions of Part A shall apply.

### **B7.1.5 MATERIALS**

The provisions of Part A shall apply.

### **B7.1.6 CONSTRUCTION EQUIPMENT**

The provisions of Part A shall apply.

### **B7.1.7 EXECUTION OF THE WORKS**

The provisions of Part A shall apply.

### **B7.1.8 WORKMANSHIP**

The provisions of Part A shall apply.

# C7.1 REPLACEMENT OF EXISTING JOINT SEALANT

## PART C: MEASUREMENT AND PAYMENT

### (i) Preamble

The tendered rate for each item shall include full compensation for providing, maintaining and decommissioning upon completion, all the plant, equipment, labour, tools, incidentals and supervision necessary to carry out the activity and construct the works under the relevant pay item, unless otherwise stated.

No extra over payment shall apply to work carried out in restricted areas for work carried out in conformance to this Chapter. The rates tendered for the payment items in this Chapter shall include full compensation for any work in restricted areas.

The requirements of Section C1.1 of Chapter 1 shall apply.

Where pay item descriptions include any wording in brackets it is an indication that contract specific information is to be inserted in the Pricing Schedule included in the Contract Documentation.

### (ii) Notes on measurement and pay items

None.

### (iii) Items that will not be measured separately

The following activities, whether required to complete the specified work or not, will not be measured and paid for separately and the Contractor shall include the cost thereof in other pay items as he deems appropriate:

1. No separate payment will be made for setting out the works.
2. No separate payment will be made for the protection or repair as required of any existing or new road furniture, structures, buildings, infrastructure or services damaged by the Contractor's activities.
3. No additional payment shall be made, nor shall any claim for additional payment be considered, for any specified work in confined or restricted areas. Any additional costs associated with working in confined or restricted areas shall be deemed to be included in the standard applicable pay items.
4. No separate payment will be made for the loading of any materials.
5. No separate payment will be made for the hauling of any materials where the material is moved over a distance of less than, and up to 1,0 km.
6. No separate payment will be made for transporting materials from commercial sources irrespective of the haul distance.
7. No separate payment will be made for the removal or any surplus material imported to complete the works.
8. For all Works performed, precautionary measures required in terms of the Occupational Health and Safety Act (Act 85 of 1993) and the latest amendments thereof as well as the latest Construction Regulations shall be deemed included in the rates tendered for the relevant products.

### (iv) Items to be measured and paid for using items specified elsewhere in the specifications

Not applicable to this Section.

### (v) Items specifically for this Section of the specifications

Item	Description	Unit
<b>C7.1.1</b>	<b>Replacing of joint sealant in existing concrete pavement as follows:</b>	
C7.1.1.1	Removal of existing seal and backing material	metre (m)
C7.1.1.2	Reaming of existing joints (indicate width and depth)	metre (m)
C7.1.1.3	Bevelling of one side of the joint to a dimension of 10 mm X 10 mm	metre (m)
C7.1.1.4	Bevelling of both sides of the joint to a dimension of 10 mm X 10 mm	metre (m)
C7.1.1.5	Installation of backing material in saw cut joints (to fit saw cut dimensions)	metre (m)
C7.1.1.6	Installation of cold pour sealant	litre (ℓ)

The tendered rate for the removal of the existing seal and backing material for C7.1.1.1 and 2 shall include full compensation for providing labour and equipment required. The tendered rate shall also include for the disposal of the removed seal and backing material.

The unit of measurement for reaming of joints in existing concrete pavements shall be the metre of reaming of the existing joint.

The unit of measurement for bevelling shall be the metre (m) of bevelling undertaken at longitudinal and transverse joints and cracks. Distinction shall be made between different sizes of bevelling and for bevelling on one or both sides of joints/cracks.

The tendered rate for bevelling and routing shall include full compensation for providing the plant and equipment required and for cutting the bevels and rout grooves to the required dimensions indicated on the drawings as well as for the cleaning of the routed crack/joint by means of high pressure water jetting followed by oil free high pressure air jetting prior to the installation of the back-up material or sealant.

The tendered rate for the installation of the back-up material shall include full compensation for providing the labour and equipment required. The tendered rate shall also include for the cleaning of the joint by means of high pressure water jetting followed by oil free high pressure air jetting prior to the installation of the back-up material.

The unit of measurement of cold poured liquid sealant shall be the litre (ℓ) of cold-poured liquid sealant applied to the joint reservoir. The tendered rate for cold-poured liquid sealants shall include full compensation for the supply and delivery of the materials to the point of installation and the installation of the sealant. The tendered rate shall also include for the supply and application of joint primer to the vertical faces of the joint groove.

In measuring the liquid sealant (litres) the following two distinctions shall be made:

- (i) Saw cut joints and/or cracks: Measurement shall be calculated in place to the dimensions specified on the drawings.
- (ii) Routed joints/cracks: Measurement shall be calculated in accordance with the volume of the sealant supplied in drums (containers) less 5 % to allow for shrinkage on curing.

Item	Description	Unit
<b>C7.1.2</b>	<b>Costs incurred due to repair and monitoring in terms of Product Performance Guarantee System (PPGS)</b>	<b>Lump sum</b>

The unit of measurement provides for the costs incurred by the Employer during monitoring and evaluation (after certificate of completion) for assessments during the PPGS phases, i.e. work undertaken by the Engineer.

# **D7.1 REPLACEMENT OF EXISTING JOINT SEALANT**

## **PART D: GUARANTEES AND COMPLIANCE CERTIFICATES**

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- D7.1.5 MATERIALS**
- D7.1.6 CONSTRUCTION EQUIPMENT**
- D7.1.7 EXECUTION OF THE WORKS**
- D7.1.8 WORKMANSHIP**

### **D7.1.1 SCOPE**

This Part deals with the installation of joint seals in terms of a Product Performance Guarantee System (PPGS). This Part shall also cover the re-sealing of all joints in the longitudinal weakened plane, transverse and longitudinal contraction and longitudinal construction joints (where directed by the Engineer) in the existing concrete pavement.

### **D7.1.2 DEFINITIONS**

The definitions applicable to Clause A7.1.2 shall apply.

### **D7.1.3 GENERAL**

This Section covers the specifications and work related to the functional condition of the liquid silicone, or such alternative product as may be accepted by the Engineer, used for the sealing of saw cut joints in the longitudinal weakened plane, transverse contraction and longitudinal construction joints in the concrete pavement in terms of a product performance guarantee.

The pre-treatment or accepted alternative specified herein shall in terms of this part of the specification automatically form part of the Product Performance Guarantee System (PPGS).

The conditions contained in this section of the project document shall only be applicable to joints repaired under the contract with a cold poured liquid sealant or such alternative product as may be accepted by the Engineer.

In support of any tender submitted either as proposed in these contract Documents, or as an alternative, the tenderer shall comply with the followings additional requirements:

- Quality Assurance Plan
- Use of "Professional Partner"
- Design constraints for PPGS
- Technical report

### **D7.1.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

A requirement of this contract shall be that the liquid sealant used in the joint grooves shall comply with a performance guarantee which shall be subject to conditions stipulated in the special conditions and project specification.

The requirements to which the liquid sealant shall conform during the guarantee periods shall be in accordance with the functional conditions of the sealant as described

### **D7.1.5 MATERIALS**

#### **D7.1.5.1 Materials for joints**

Materials used for sealing of joints shall not be older than six (6) months. The age of sealant shall be certified by an approved testing facility.

The silicone sealant must be applied by means of pumping the sealant from a storage contained through compressed air powered pumping equipment and applied to the joint slot by means of nozzles designed to ensure that the slot is filled with sealant as indicated on the drawings. Application of the sealant to the joint slot by hand shall not be permitted."

## **D7.1.6 CONSTRUCTION EQUIPMENT**

The Contractor shall provide all the necessary tools and equipment in order to complete the work in accordance with the guarantee requirements.

## **D7.1.7 EXECUTION OF THE WORKS**

### **D7.1.7.1 Pavement description and extent of joint repairs covered by the PPGS**

#### **a) Definition of terms**

The definition of terms used herein are in accordance with TMH9.

#### **b) Description of the existing pavement, condition and related issues**

Information pertaining to the above matters are contained in the Contract Documentation.

#### **c) Methodology for joint resealing of the concrete pavement**

All the transverse contraction joints together with the longitudinal weakened plane joints on the pavement are to be resealed under this contract. The resealing of these joints is to prevent the infiltration of water and any incompressible material entering into the joint.

## **D7.1.8 WORKMANSHIP**

### **D7.1.8.1 General**

The onus rests entirely on the Contractor to produce work which conforms in quality to the specifications and requirements herein, or such other specification and requirements as defined in the accepted tender that will perform in terms of the requirements of the Product Performance Guarantee System (PPGS).

Any design constraints envisaged by the Contractor on the PPGS related product or alternative approved product shall be highlighted on the relevant Returnable Schedules.

Furthermore, the Contractor shall, together with his programme of work stipulated in Chapter 1 as relevant, or at such time as approved by the Engineer, submit proposals to the Engineer regarding the manner in which his quality management programme and testing frequencies are to be undertaken.

The Engineer shall however, conduct such tests as he may deem applicable and shall retain all rights as determined in the General Conditions of Contract related to bad workmanship or unacceptable materials. This shall also be applicable to accepted alternative material and related specifications.

Any of the Engineers actions hereunder shall however not be construed to relive the Contractor of his responsibilities in terms of the PPGS specified herein.

### **D7.1.8.2 Composition of visual assessment panel and reporting**

The visual assessment of the condition of the liquid silicone or other approved sealant in the joints of the concrete pavement shall be undertaken by means of a visual assessment panel comprising the following representatives:

- |                                                                 |                   |
|-----------------------------------------------------------------|-------------------|
| • Employer                                                      | 2 representatives |
| • Contractor                                                    | 2 representatives |
| • Consulting Engineer or a suitably qualified external assessor | 1 representative  |

The Contractor shall provide proof that his representatives are suitably qualified.

All site investigations or inspections and reporting by the panel of representatives shall be undertaken on a biannual basis within two months of completion. The arrangements, responsibilities and costs for such inspections shall be vested with each party.

Reporting, which shall be the responsibility of the Contractor shall consist of the following:

- Completion and copying of report forms in accordance with the Employer's requirements.
- Compiling of a report on finding as well as proposed remedial measures

The above-mentioned requirements shall be completed and delivered in triplicate to the office of the Employer within one calendar month of inspections date.

### **D7.1.8.3 Types and definition of distress**

#### **a) Types of distress**

The types of distress influencing the functional condition of the liquid silicone, or other approved sealant and which are to be monitored in terms of this Chapter are as follows:

- Adhesion
- Cohesion
- Extrusion
- Weed growth
- Deformation

Distress to the liquid sealant as a result of mechanical damage shall not be classified as a type of distress in terms of the production performance guarantee system.

**b) Definition of distress**

*(i) Adhesion*

This type of distress occurs when the liquid sealant has lost its bond with the joint face of the concrete pavement (i.e. no adhesion between the liquid sealant and the joint face). In measuring this condition, distinction shall be made between loss of adhesion on one side and loss of adhesion on both sides of the joint. The ruler test method as described in Chapter 20 shall be employed to test the adhesion as described herein.

Should 20 % of the ruler be loose, the seal shall be noted as loose. The frequency of the ruler test per unit length shall be agreed upon by the panel.

*(ii) Cohesion*

This type of distress occurs when the liquid sealant loses its elasticity and develops cracks in the seal itself while still being bonded to the joint faces on either side of the crack. Should cracks be visible with the naked eye, the seal shall be noted as having poor cohesion.

*(iii) Extrusion*

This condition occurs when the joint is devoid of any liquid sealant material (i.e. the liquid sealant is missing or loose on both sides).

*(iv) Weed growth*

This type of distress occurs when weed or any other form of vegetation/grass grows within the confines of the joint.

*(v) Deformation*

This type of distress occurs when the tooled surface of the liquid sealant takes on a damaged or deformed shape (i.e. an irregular shape) while still being bonded to the joint faces of the concrete pavement.

**c) Field measurements**

*(i) Frequency and documentation*

The monitoring of the condition of the joint seals shall be undertaken on a biannual basis in the month of the completion of the works and shall be carried out on portions of the whole of the works as directed by the Employer or his appointed representative. The monitoring shall take place during times of peak traffic.

The first measurements shall be undertaken after the completion date of the contract and thereafter at two yearly intervals within two months of the month of the first inspection up to the end of the guarantee period.

All measurements taken in terms of the above requirements shall be fully documented and kept in a place of safekeeping by the Employer.

*(ii) Position of measurements*

The measurements of defective joint seals within a number of pre-determined sections of the road (positions of sections to be determined by the panel) shall be determined by means of a visual inspection and tests of all transverse contraction joints, longitudinal weakened plane joints and joints replaced under this contract within each predetermined section. In taking these measurements, the following requirements shall be complied with:

1. The minimum length of a section shall be 200 m
2. Each carriageway shall be measured separately
3. The minimum length of any distress item to be measured and used in calculating the normal shall be as follows:
  - 0,5 m for adhesion (one or both sides), cohesion, extrusion and deformation
  - 0,3 m for weed growth
4. Longitudinal weakened plane joints, and transverse contraction joints shall be measured separately.

**d) Evaluation of acceptance by Engineer**

The following criteria shall be applied by the Engineer to determine the acceptance of the PPGS portion of the work to determine whether remedial work is required to the PPGS portion of the work. These rules shall be applied after each of the assessments as appropriate.

*(i) Assessment on completion of the work*

An assessment shall be done on completion of the work and all defects must be repaired by the Contractor before a Certificate of Completion will be issued. The Certificate of Completion shall only be issued after the Contractor has provided the Performance Guarantee for the eight (8) year period.

*(ii) Assessment after year two (2) of the Defects Notification Period*

Should all parameters meet the full Acceptance Criteria, then the Engineer shall issue a report to the Contractor confirming the results of the assessment and confirming that the first two years of the Defects Notification Period have been successfully completed. The Employer will release the first of the performance guarantees provided by the Contractor.

Should one or more of the parameters fail to meet the full Acceptance Criteria, then the Engineer, in consultation with the Employer, shall decide whether or not immediate remedial work will be required to be carried out at that stage. The Engineer shall issue a report to the Contractor confirming the results of the assessment.

Should the Engineer, after consultation with the Employer, confirm that due to one or more of the parameters failing to meet the criteria, then the performance guarantee provided by the Contractor for the first two years of the Defects Notification Period would not be released but would be retained until the end of the Defects Notification Period, or until the relevant remedial work has been

successfully completed, whichever is the sooner. Alternatively, the Contractor shall have the option of rectifying the defects in return for the release of the first of the performance guarantees provided by the Contractor.

Should the Engineer, in consultation with the Employer, confirm that immediate remedial work is required in respect of one or more of the parameters then the Contractor shall immediately propose a solution to rectify the problem in accordance with Clause D.7.1.8. The Engineer's approval shall be obtained prior to the Contractors carrying out any remedial work. Notwithstanding the approval by the Engineer of the remedial work, the Contractor shall remain fully liable for the performance of his proposed remedial action(s) measured in terms of the specified performance parameter. Once the remedial work has been successfully completed, then the Engineer will issue a report to the Contractor recording the remedial work done and confirming the results of the assessment.

The first of the performance guarantees provided by the Contractor, would then be released.

(iii) *Assessment after year six (6) of the Defect Notification Period*

Should all parameters meet the full Acceptance Criteria, then the Engineer shall issue a report to the Contractor confirming the results of the assessment and confirming that the first six years of the Defect Notification Period have been successfully completed. The Employer will also release the second of the performance guarantees provided by the Contractor.

Should one or more of the parameter fail to meet the full Acceptance Criteria, then the Engineer, in consultation with the Employer, shall decide whether or not the immediate remedial work will be required to be carried out at that stage. The Engineer will issue a report to the Contractor confirming the results of the assessment.

Should the Engineer, after consultation with the Employer, confirm that no immediate remedial work is required at that stage, then the performance guarantee provided by the Contractor for the first two years of the Defect Notification Period (if not previously released) as well as that provided for the first six years of the defects Notification Period, would not be released but would be retained until the end of the defects Notification Period, or until the relevant remedial work has been successfully completed, whichever is the sooner. Alternatively, the Contractor shall have the option of rectifying the defects in return for the release of the first of the performance guarantees provided by the Contractor (if not previously released), as well as of the second of the performance guarantees provided by the Contractor.

Should the Engineer, in consultation with the Employer, confirm that immediate remedial is required in respect of one or more of the parameters, then the Contractor shall immediately propose a solution to rectify the problem(s) in accordance with Section D7.1. The Engineer's approval shall be obtained prior to the Contractor's carrying out any remedial work. Notwithstanding the approval by the Engineer of the remedial work, the Contractor shall remain fully liable for the performance of his proposed action(s) measured in terms of the specified performance parameters. Once the remedial work has been successfully completed, then the Engineer will issue a report to the Contractor recording the remedial work done and confirming the results of the assessment.

The first of the performance guarantees provided by the Contractor (if not previously released) and the second performance guarantee, would then be released.

(iv) *Assessment after year eight (8) of the Defects Notification Period*

Should all parameters meet the full Acceptance Criteria, then the Engineer shall issue a First Approval Certificate in terms relevant Conditions of Contract for Construction, confirming the results of the assessment and confirming that the entire eight-year Defects Notification Period has been successfully completed. The contract shall then be complete and the Contractor shall then have no further liability for the performance of the PPGS portion of the work. The Employer shall release all outstanding performance guarantees provided by the Contractor for the entire Defects Notification Period.

Should one or more parameters fail to meet the full Acceptance Criteria then the Engineer, in consultation with the Employer, shall decide whether or not immediate remedial work will be required to be carried out at that stage. The Engineer will issue a report to the Contractor confirming the results of the assessment. The first and second performance guarantee provided by the Contractor, if not previously released would now be released. The final performance guarantee would not be released but would be redeemed by the Employer, with an amount of money (to be agreed with the Contractor as a fair value of any future remedial work, and with the balance being released to the Contractor. The Contract shall then be complete and the Engineer shall issue the Final Approval Certificate in terms of the Conditions of Contract. The Contractor shall then have no further liability for the performance of the PPGS portion of the work, except for latent defects which may be identified.

Alternatively the Contractor shall have the option of rectifying the defects in return for the release of the full final performance guarantee for the Defects Notification Period.

Should the Engineer, in consultation with the Employer, confirm that immediate remedial work is required in respect of one or more of the parameters, then the Contractor shall immediately propose a solution to rectify the problem in accordance with the contract. The Engineer's approval shall be obtained prior to the Contractors carrying out any remedial work. Once the remedial work has been successfully completed, then the Engineer will issue a report to the Contractor confirming the results of the final assessment. Should all parameters fall within the full acceptance category, then all outstanding performance guarantees in the possession of the Employer shall be released. The contract shall then have no further liability for the performance of the PPGS portion of the work, except for latent defects which may be identified.

(v) *Assessment at any time during the Defects Notification Period*

The Employer or his agent shall be entitled to carry out an assessment for the work at any time during the Defects Notification Period. Should any parameter fall into the remedial work required category, the Employer or his agent shall inform the Contractor who shall immediately propose a solution to rectify the problem, and obtain the Employer's or his agents approval and rectify the problem in accordance with the approved method.

(vi) *Data processing*

Data obtained from field measurements pertaining to the condition of the joint seals shall be processed to produce results in the manner presented in Table D7.1.8-1:

**Table D7.1.8-1: Data processing**

Item	Specification
Type of measure	Linear Metre (m) (tape measure)
Segment of length	200 m*
Method of assessment of data	The ratio of the damaged seal to the total length of seal inspected for the various types of distress measured in metres and expressed as a percentage.  Longitudinal and transverse joints to be measured separately

\* This length can be measured over any 200 m section of carriageway and need not commence directly adjacent to the termination of an abutting section, provided that no two sections shall overlap with one another

#### D7.1.8.4 Acceptance criteria

The measured defective joints shall meet with the acceptance criteria listed in Table D7.1.8-2:

**Table D7.1.8-2: Acceptance criteria**

Time after commencement of the PPG period (yrs)	Maximum permissible distress length calculated (percentage %) of segment of transvers or longitudinal joint for the various types of distress									
	Adhesion		Cohesion		Extrusion		Weed Growth	Deformation		
	L	T	L	T	L	T	L+T	L	T	
2	0	0	0	0	0	0	0	0	0	
4	2	2.5	2	2.5	0	0	0	0	0	
6	4	5	4	5	2	2.5	1	2	2.5	
8	12	15	12	15	8	10	2	4	5	

L = Longitudinal weakened plane joint T = Transverse contraction joint

In the event of the types of distress listed in Table D7.1.8-2 occurring simultaneously, then the maximum permissible distress values (calculated by the summation of the percentage listed in Table D7.1.8-2 for the specified times after opening the concrete pavement to traffic shall meet with the criteria listed in Table D7.1.8-3.

**Table D7.1.8-3: Acceptance criteria**

Time after commencement of the PPG period (years)	Maximum permissible distress for all the types of distress listed in Table G1008/1
2	0 %
4	5 %
6	20 %
8	30 %

#### D7.1.8.5 Procedures to be adopted in the event of failure during the guarantee period

Where failures have occurred relating to the performance of the sealant under traffic or any other reason due to workmanship or materials used, the Contractor shall at his own expense, rectify all segments in which such defects occur which exceeds the permissible criteria as indicated in Table D7.1.8-2 as to bring the number the number of defects within the permissible limits. Actual repairs required shall be agreed by the panel.

Repair works shall be carried out at any time when required during the Guarantee Period, but at least during 2, 4, 6 and 8 as specified. During years 2, 4, 6 and 8 repair works shall be carried out within a reasonable time after the specified inspections as agreed with the Employer and these repair works will not be subject to a lane rental. Where repair works are required before the inspection in year 2, a lane rental charge shall be applicable as stated in the Contract Data. The lane rental fee units shall be per lane per hour. No lane rental charge is applicable after the inspection in year 2.

In the event of the Contractor failing to undertake the required steps to rectify/reinstate the defects to conform with the specified requirements, the Employer reserves the right to withhold payment of any monies which are payable to the Contractor or which may become payable under the contract, or should no such monies be owing, to call in the guarantee issued under the PPGS.

Furthermore, the Employer shall employ all such powers vested in him in terms of the General Conditions of Contract to uphold and enforce the requirements specified herein related to the extended performance guarantee.

Should an alternative tender or contract guarantee period be accepted, the repair programme shall be as per the accepted alternative.

At the end of the Guarantee Period, and when the applicable maintenance certificate has been issued, all repair and maintenance responsibilities shall become the responsibility of the Employer, except for latent defects which may arise after the end of the product performance guarantee period.

### **D7.1.8.6 Notification of remedial work**

The Employer or his agent shall notify the Contractor in writing of any remedial work or repairs required to the liquid sealant or accepted alternative seal in terms of the product performance guarantee. Such notification shall take place at any time during the guarantee period, but at least after year 2, 4, 6 and 8 such intervals as may be defined in an alternative tender.

The Contractor shall commence with the remedial work within thirty (30) days from the date on which he site is handed to him by an order in writing from the Employer or his agent after the submission of a programme within fourteen (14) days from the date of the order.

### **D7.1.8.7 Remedial work**

All remedial work or repairs to the liquid sealant or accepted alternative seal shall comply with the following requirements:

- a) The Contractor shall at his own cost supply, erect and maintain the necessary temporary traffic control signs in accordance with the requirements contained in Section A1.5 of Chapter 1, the drawings, and the latest edition of the South African Road Traffic Signs Manual. Any future amendments to the aforementioned manual shall also be complied with.
- b) The Contractor shall also, at his own cost, repair/reinstate such items as road studs, road marking etc. should these be damaged or influenced by the required remedial work.
- c) The only permissible types of liquid sealant material used for repairing the joints on this contract during the PPG Period shall be as follows:
  - The product initially accepted to complete the project
  - Any new or alternative product specifically accepted by the Employer

The costs incurred by the Employer for the repair and monitoring required in terms of the PPGS shall be deemed to be covered by the lump sum allowed for in item C7.1.2.

### **D7.1.8.8 Alternative materials and design**

The tender is afforded the opportunity to allow for alternative materials and specifications for work related to the product performance guarantee system other than that allowed for in the contract documents.

Such alternatives shall however be identified at tender stage.

Full details relating to alternative tenders such as field measurements, acceptance criteria and proposed remedial work shall be submitted in a manner similar to that prescribed in Clause D7.1.8.4

Alternative materials, properties or remedial measures proposed by the Contractor shall be to the acceptance of the Employer or his designated representatives.

### **D7.1.8.9 Work on behalf of Employer**

The Employer reserves the right during the periods in which remedial work is being undertaken in terms of the PPGS to order in writing additional remedial work relating specifically to repairs to the joints sealed under the contract. Payment for such additional work shall be classed as "day works" (costs plus 15 %) and the Contractor shall be compensated in accordance with relevant Conditions of Contract for Construction.

## 7.2 REPAIR TO EXISTING JOINTS AND UNCONTROLLED CRACKS IN CONCRETE PAVEMENTS

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## A7.2 REPAIR TO EXISTING JOINTS AND UNCONTROLLED CRACKS IN CONCRETE PAVEMENTS

### PART A: SPECIFICATIONS

#### A7.2.1 SCOPE

This Section covers work related to the repair of pavements across isolated uncontrolled cracks as well as repair of existing joints in concrete pavements in the following instances:

- Repair of joints as well as uncontrolled cracking as part of the periodic maintenance/repair of existing pavements which includes repair to the adjacent concrete. It may also require the retro-fitting of tie-bars and/or dowel bars in order to provide load transfer capacity over the crack or joint as identified. This instance the area of repair shall be limited to only a portion of a panel adjacent to a joint, but may also traverse an existing joint into a portion of an adjacent panel. In JCP pavements where the area covers a total existing panel area, the repairs shall be carried out in conformance to the requirements specified in Section 7.3 as relevant.

#### A7.2.2 DEFINITIONS

**Concrete Pavement Types** - as defined in Clause A6.1.2 of Chapter 6.

**Joint types** - weakened-plane joints including transverse contraction, longitudinal hinge, expansion and transverse construction joints as indicated on the Drawings.

**Uncontrolled Cracking** - as defined in TMH 9: Part C - Standard Visual Assessment Manual for Rigid Pavements.

#### A7.2.3 GENERAL

##### A7.2.3.1 General Requirements

Notwithstanding any specific requirements as prescribed in this Chapter, all work done shall be in conformance with all generally accepted good practice recommendations as published in relevant industry guidelines to ensure adequate performance of the finished work. The Contractor shall submit a method statement setting out the methodology he intends utilising for all operations envisaged to ensure conformance to all the specified final requirements which shall be subject to the approval of the Engineer.

### **A7.2.3.2 Weather limitations**

The weather limitations stated in Clause A6.1.3 of Chapter 6 shall also be applicable in this instance.

## **A7.2.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

The Contractor shall design the concrete mix to comply with all the flexural strength and compressive strength requirements as specified in Clause A6.1.4.2 of Chapter 6, with the exception that a rapid hardening CEM 52,5 R as specified in SANS EN 197-1, shall be incorporated to permit trafficking within the prescribed period. Additional admixtures in the form of accelerators may be included however the dosage thereof shall be limited to 2 % of the mass of the cement. The characteristics of the mix shall be such that the concrete can be placed, consolidated and finished within the delivery and time constraints associated with the method statement as approved.

All mix designs shall be compiled by an approved concrete testing laboratory and approved by the Engineer.

## **A7.2.5 MATERIALS**

### **A7.2.5.1 Aggregates**

The aggregates incorporated in the replacement concrete shall comply with all the requirements as prescribed in Clause A6.1.5 of Chapter 6. The Nominal Maximum Size of the aggregate shall be appropriate to the thickness of concrete to be placed and the placing and finishing methodology to be used.

### **A7.2.5.2 Water**

The requirements for water incorporated into the concrete mix shall be as specified in Clause A6.1.5 of Chapter 6.

### **A7.2.5.3 Cement**

A high early strength cement shall be used for all full depth repairs. The accelerated strength shall be gained by using CEM class 52,5 R in conjunction with an accelerator if required, but only if approved.

### **A7.2.5.4 Epoxy and repair products**

The following repair and adhesive products to be utilised where specified shall appropriate for the intended purpose and shall be accepted by the Engineer:

- A semi-fluid epoxy adhesive paste for the bonding of new concrete to existing concrete (wet to dry).
- A polyamide cured thixotropic epoxy adhesive paste for bonding tie bars to existing concrete and small epoxy repairs
- High strength concrete for partial depth repairs, filling tie bar and dowel slots as well as grout holes
- An epoxy for filling saw cuts
- A cementitious non-shrink grout for filling of wide joints
- A self-levelling pourable epoxy grout for use in cross stitching
- A low viscosity pourable epoxy for use in crack injection

The use of epoxy grout to repair spalling along transverse or longitudinal joints shall not be permitted. Spalled joints which are not eliminated by the simultaneous repair of cracks in the close vicinity of the joints, shall be repaired by one of the types of treatment, specified hereinafter and as shown on the drawings.

### **A7.2.5.5 Bond breaking products**

A bond breaking product as shown on the drawings shall be applied to existing concrete faces where movement is to take place before the casting of new concrete against it. The bond breaking product to be used shall be approved by the Engineer or alternatively, Contractor's PVA paint or similar approved material applied at a nominal rate of 0,25  $\ell/m^2$ .

### **A7.2.5.6 Tie bars, dowels, continuous reinforcing steel and steel mesh**

The dimensions of any steel products shall be as specified in the Contract Documentation. The requirements for any steel shall be as specified in Clause A6.1.5 of Chapter 6 as relevant.

## **A7.2.6 CONSTRUCTION EQUIPMENT**

All construction equipment shall be suitable for the specific use and size of working area and be capable of completing all the specified construction work within the specified properties and construction tolerances.

The Contractor shall prepare the list of construction equipment required for the type and extent of repair for the specific project. The following types of construction equipment are typically required for patching:

- Pedestrian and small ride-on roller,
- Vibratory plate compactor,
- Mobile compressor with matched paving breakers,
- Mechanical saw and hand tools,

- Drilling equipment,
- Hand-operated compactor,
- Mobile concrete mixer,
- Tractor loader backhoe (TLB) or small front-end loader.
- Poker vibrators
- Vibrating levelling screeds/beams
- Any other tools and equipment necessary to complete the work in accordance with all the specified requirements

## **A7.2.7 EXECUTION OF THE WORKS**

### **A7.2.7.1 Repairing joints and cracks**

The use of epoxy grout to repair spalling along transverse or longitudinal joints shall not be permitted. Spalled joints which are not eliminated by the simultaneous repair of cracks in the close vicinity of the joints, shall be repaired by one of the types of treatment, specified hereinafter and as shown on the drawings.

Wherever joints or cracks in the concrete pavement are formed or repaired, these shall be thoroughly cleaned of debris to the satisfaction of the Engineer by means of high-pressure water jetting followed by high-pressure, oil-free air jetting to finally clean and dry the joints and/or cracks before the installation of the cold-poured liquid sealant.

The following types of repair treatment shall be undertaken on existing joints/ cracks in the concrete pavement.

The execution of the work shall be as specified below for the various types of treatments listed:

#### **a) Type R1 Treatment: (Bevelling of spalled edges and resealing)**

This treatment shall apply to joints spalled to degrees of medium and high severity as defined in TMH 9. Existing seals shall be removed and the joints reamed out to produce clean-cut surfaces as described in Clause A7.1.7.1 above. The edges of the joints shall then be bevelled by means of a mechanical device to dimensions of 10 mm, 15 mm or 20 mm (dependant on the depth of the spall) at a 45° angle before the installation of the liquid sealant as described in Clause A7.1.7.1.

#### **b) Type R2 Treatment: (Routing and bevelling of active cracks)**

This treatment shall be applicable where identified active transverse or longitudinal cracks are to be treated without the breaking up of the concrete slabs or portions thereof. This treatment shall entail the routing of cracks to the specified width and depth ratio as indicated on the drawings. Back-up material shall be placed at the bottom of the routed slot and the remainder of the slot then be filled with a cold-poured liquid sealant to the requirements and tolerances as prescribed in Clause A7.1.7.1. The routing and bevelling shall be executed in such a way that the actual crack is always visible in the middle third of the width of the routed slot. This treatment may also be applicable to severely spalled transverse construction joints.

#### **c) Type R3 Treatment: (Routing and bevelling of non- active cracks)**

This treatment is similar to treatment type R1 above except that the routing shall be executed to a constant depth and width of 15 mm x 15 mm. The joint reservoir shall then be filled with a cold-poured liquid sealant. This treatment shall apply to smaller cracks or transverse construction joints which show a high degree of spalling.

#### **d) Type R4 Treatment: (Bevelling of forward slabs where faulting has occurred)**

This treatment applies at transverse joints where the approach slab is 5,0 mm or more higher than the leave slab and entails the removal of the existing seal, the bevelling of the higher edge (approach slab) and installing the new liquid sealant as prescribed in Clause A7.1.7.1.

#### **e) Type R5 Treatment: (Cross-stitching)**

This treatment shall apply to longitudinal joints and cracks and shall be used to maintain load transfer and to provide added strength by preventing further movement of the joints/cracks.

Cross-stitching shall be carried out on active cracks before the application of a liquid sealant but after sub-sealing / slab-jacking if applicable. Longitudinal cracks which have assumed the role of an adjacent longitudinal joint (i.e. where movement takes place) shall not be cross-stitched.

This operation involves the cutting of slots into the concrete pavement measuring  $\pm 1\ 000$  mm x 50 mm x 175 mm using the smallest saw blade diameter possible. The slots shall be cut equidistant on either side of the crack and at right-angles to the longitudinal axis of the pavement. The slots shall be cleaned by means of water jetting and oil-free compressed air and a 16mm diameter reinforcing bar 760 mm long inserted in the bottom of the slot.

The bar shall then be covered with a self-levelling pourable epoxy grout followed by a layer of 7,1 mm crushed stone. The remainder of the slot is filled with a primer if specified by the manufacturer and followed with the provision of a high strength concrete Class 50/7 and finished-off level with the pavement surface. Excess material is removed and the surface is left in a clean condition.

A minimum period of 3 days shall lapse between the placing of the high strength concrete and the opening of the road to traffic. Any excess material resulting after the setting of the high strength concrete shall be removed to ensure the slot is finished to the same level as the adjacent concrete.

#### **f) Type R6 Treatment: (Crack injection)**

Crack injection treatment shall be used for the reinstatement of slab integrity on low-severity inactive longitudinal and transverse cracks. The crack shall be reamed out to a width and depth as indicated by the Engineer. Maximum width shall not exceed 12 mm and the maximum depth shall not to exceed 42 mm.

The reamed-out crack is then cleaned with a high pressure water jet, followed by the use of oil-free compressed air to remove any residual dirt. The surfaces shall be clean and dry before a low viscosity pourable epoxy is used under the manufacturer's recommendations to fill the

crack. The epoxy shall be slowly gravity fed into the reservoir. Sufficient time is to elapse before the crack is topped up with resin to a final level not exceeding the bottom of the reservoir.

The resin should be allowed to cure for 24 hours before joint-sealing can take place as described in Clause A7.1.7.1. The repaired section can then be opened up to traffic after 3 days.

**g) Type R7 Treatment: (Restoration of load transfer at transverse contraction joints)**

This method of treatment is required at transverse joints where load transfer between adjacent slabs has deteriorated and resulted in pumping, faulting, corner breaks and spalling.

This work shall involve the installation of 32 mm diameter dowels placed at mid-depth in the concrete pavement by means of cutting slots 640 mm in length, 90 mm wide and 175 mm deep in the wheel path and across the existing transverse contraction joint. The sliding end of the dowels shall be treated with a bond-breaking compound to prevent the concrete from adhering to it. The slots shall be cleaned by means of water jetting and oil-free compressed air. Dowels fitted with end caps shall be inserted parallel to the longitudinal axis of the road and shall be placed on supports of non-shrink grout. The slots shall then be filled with a high strength concrete Class 50/7 and finished flush with the existing concrete pavement surface.

Excess material shall be removed and the surface left in a clean condition. The reinstatement of the transverse joint shall be undertaken in accordance with Clause A7.1.7.1.

**h) R8 Treatment: (Forming and sealing of joints between asphalt surfacing and concrete pavements)**

This method entails the saw cutting of a slot 50 mm deep in the existing asphalt surfacing directly adjacent to the concrete pavement, the cleaning of the joint reservoir and re-sealing of the joint with back-up material and a liquid sealant. Where excessive damage of the existing asphalt has taken place at the contact line between the asphalt and the liquid seal, the asphalt shall be removed to a width of 100 mm or 150 mm and replaced with continuously graded asphalt. The new seal shall then be installed as described in the first sentence of this paragraph.

### **A7.2.7.2 Repairing joints and cracks by full-depth removal of concrete adjacent to the crack or joint**

The execution of the work shall be as specified below for the various types of treatments listed:

**a) Transverse crack and joint repairs by full depth removal of existing adjacent concrete and incorporating the following treatments:**

*(i) Type T1 Treatment*

This treatment applies to active transverse cracks situated approximately in the middle third of a slab or series of transverse slabs. The existing concrete on either side of the crack is to be broken up and removed after two parallel saw cuts are made at positions indicated by the Engineer. Before the new concrete is replaced, tie bars are to be installed along one of the existing transverse concrete faces by means of drilling horizontal holes in the existing concrete and fixing tie bars with an epoxy adhesive paste. The vertical side of the existing concrete face with tiebars is then treated with a wet-to-dry epoxy adhesive. The other face is treated with a bondbreaker. The concrete and mesh are placed. New concrete shall be rounded and existing concrete mechanically bevelled along the line of contact. The line of contact between existing and new concrete which is not tied shall be sawn in one operation to a specified width and depth and the installation of a back-up material and a liquid sealant.

*(ii) Type T2 Treatment*

This treatment applies to the repair of transverse cracks in close proximity to transverse joints where the one limit of the concrete repair area coincides with an existing transverse joint. A saw cut parallel to the joint encompassing the crack is made at a position indicated by the Engineer. The existing concrete on either side of the crack is to be broken up and removed. Before the new concrete is replaced, tie bars are to be installed along the newly cut face opposite the joint face by means of drilling horizontal holes in the existing concrete and fixing tie bars with an epoxy adhesive paste. The vertical side of the concrete face with tiebars is then treated with a wet-to-dry epoxy adhesive. The other face is treated with a bondbreaker. The concrete and mesh are placed. New concrete shall be rounded and existing concrete mechanically bevelled along the line of contact. A sawcut is made along the same line of the existing transverse joint on the contact line of existing and new concrete in one operation to a specified depth and width and installation of a back-up material and a new liquid sealant.

*(iii) Type T3 Treatment*

This treatment applies where existing concrete is removed on either side of an existing transverse joint due to an active transverse crack crossing over the existing joint. The existing concrete on either side of the crack is to be broken up and removed after two parallel saw cuts are made at positions indicated by the Engineer encompassing the extent of the crack. Before the new concrete is replaced, tie bars are to be installed along both of the existing transverse concrete faces by means of drilling horizontal holes in the existing concrete and fixing tie bars with an epoxy adhesive paste. The vertical sides of the existing concrete faces with tiebars are then treated with a wet-to-dry epoxy adhesive. The concrete and mesh are placed. The sawing of the joint at the location and line of the original joint is performed in two operations consisting of an early 3,0 mm wide saw cut followed by the reaming of the joint to a minimum width of 6,0 mm and depth of 35 mm and the installation of a back-up material and a liquid sealant.

*(iv) Type T4 Treatment*

This treatment is identical to type T3 treatment but applies only where the concrete is on either side of the joint line in separate operations. The new concrete on either side of the transverse joint is placed in two operations with dowel bars treated with an approved bond breaking compound as shown on the drawings and installed across the joint during the casting of the first portion of concrete. Before the second portion of concrete is cast the vertical surface of the newly cast concrete shall be treated with a bond breaking agent. The transverse joint is then sawn in two operations and followed with the installation of a back-up material and liquid sealant.

*(v) Type T5 Treatment*

This type of treatment is similar to Type T2 treatment but applies when small portions of concrete slabs are removed and replaced due to corner breaks, short cracks or similar defects. The treatment entails the drilling of horizontal holes into the existing concrete, the application of an epoxy adhesive and the installation of a minimum of 3 tie bars before the placing of new concrete. Due to the small horizontal dimensions of the repair area the normal spacing of tie bars as specified will have to be adjusted to ensure that a minimum of three tie bars are installed. Wet-to-dry epoxy adhesive shall be applied to the surfaces where tie bars are installed and a bond breaking agent along the vertical face of existing concrete at the joint where movement is to take place. A sawcut is

made along the same line of the existing transverse joint on the contact line of existing and new concrete in one operation to a specified depth and width and installation of a back-up material and a new liquid sealant.

**b) Longitudinal crack and joint repairs by full depth removal of existing concrete and incorporating the following treatments:**

*(i) Type L1 Treatment*

This treatment applies to active longitudinal cracks situated approximately in the middle third of a slab or series of longitudinal slabs. The existing concrete on either side of the crack is to be broken up and removed after two parallel saw cuts are made at positions indicated by the Engineer. Before the new concrete is replaced, tie bars are to be installed along both of the existing transverse concrete faces by means of drilling horizontal holes in the existing concrete and fixing tie bars with an epoxy adhesive paste. The vertical sides of the existing concrete faces are then treated with a wet-to-dry epoxy adhesive. New concrete and mesh shall be placed. New concrete shall be rounded and existing concrete mechanically bevelled along the line of contact.

*(ii) Type L2 Treatment*

This treatment applies to the repair of longitudinal cracks in close proximity to longitudinal joints where the one limit of the concrete repair area coincides with an existing longitudinal joint. A saw cut parallel to the joint encompassing the crack is made at a position indicated by the Engineer. The existing concrete on either side of the crack is to be broken up and removed. Before the new concrete is replaced, tie bars are to be installed along the newly cut face opposite the existing joint face by means of drilling horizontal holes in the existing concrete and fixing tie bars with an epoxy adhesive paste. Prior to placing concrete this face is to be treated with a wet-to-dry epoxy. The existing tiebars in the longitudinal joint are to be cleaned and straightened with the installation of new tie bars if necessary and a bondbreaker is applied to this face. New concrete and mesh shall be placed. New concrete shall be rounded and existing concrete mechanically bevelled along the line of contact. A sawcut is made along the same line of the existing longitudinal joint on the contact line of existing and new concrete in one operation to a specified depth and width and installation of a back-up material and a new liquid sealant.

*(iii) Type L3 Treatment*

This treatment applies where existing concrete is removed on either side of an existing longitudinal joint due to an active longitudinal crack crossing over the existing joint. The existing concrete on either side of the crack is to be broken up and removed after two parallel saw cuts are made at positions indicated by the Engineer encompassing the extent of the crack. Before the new concrete is replaced, tie bars are to be installed along both of the existing longitudinal concrete faces by means of drilling horizontal holes in the existing concrete and fixing tie bars with an epoxy adhesive paste. The vertical side of one of the existing concrete faces with tiebars is then treated with a wet-to-dry epoxy adhesive. A longitudinal construction joint with tiebars is formed on the line of the original joint with tiebars and mesh and concrete are placed on one side of the longitudinal joint. When the formwork is removed, the face of the construction joints is treated with a bond breaking compound and the other face with a wet-to-dry epoxy. The concrete and mesh are placed. The sawing of the joint at the location and line of the original joint is performed in two operations consisting of an early 3,0 mm wide saw cut followed by the reaming of the joint to a minimum width of 6,0 mm and depth of 35 mm and the installation of a back-up material and a liquid sealant.

*(iv) Type L4 Treatment*

This treatment is identical to treatment type L2 above but applies where small areas of concrete slabs are removed and replaced. The treatment entails the drilling of horizontal holes into the existing concrete, the application of an epoxy adhesive and the installation of a minimum of 3 tie bars. Wet-to-dry epoxy shall be applied to the vertical face where tie bars are installed, a bond breaking agent shall be applied along the vertical face of the existing concrete at the joint, followed by rounding of the new concrete and bevelling of existing concrete along the joint.

### **A7.2.7.3 Full depth repairs**

Full depth repairs to isolated areas in the existing concrete panels shall be carried out at positions of both transverse and longitudinal cracking where the degree of cracking has progressed to high severity and where there is evidence of surface spalling or faulting. Full depth repairs shall also be required where spalling at joints or surface "pop-outs" extend beyond a depth greater than 75 mm from the surface.

The positions and minimum dimensions of the various types of repair sections, together with the type of joint preparation required, shall be as indicated in the Contract Documentation.

Full depth repair work shall include:

- saw cutting around the perimeter of the repair sections,
- breaking up and removal of the concrete paving within the repair section,
- preparation of surfaces including repairs to subbase
- application of bond-breaker or wet to dry epoxy to faces,
- drilling and installation of tie-bars, dowels
- reinstatements of continuous reinforcing where it has been severed,
- placing and finishing of new concrete.

The nature of full depth repairs therefore is such that all identified defective concrete pavement within panels shall be repaired.

**a) Removal of existing concrete**

Prior to removal of concrete an initial full depth pilot saw cut shall be made 60 mm inside the boundary of the repair area and the concrete within this initial saw cut shall be removed by either of two methods:

- the break up and clean out method or
  - the lift out method
- (i) The break up and clean out method may be carried out with a front end loader used together with a jackhammer. Breaking out may be facilitated by additional intermediate saw cuts. The breaking operation shall proceed from the centre of the repair area towards the

boundary saw-cuts to eliminate damage to the adjoining slabs. Care shall also be taken with this method to avoid damage to the subbase or to adjacent slabs.

- (ii) The lift out method shall require lifting hooks to be attached to the slab and heavy lifting equipment to lift out larger areas. Alternatively the slab may be sawed into smaller pieces so that they can be lifted out by a front end loader. Although this method is less liable to damage the subbase and adjacent slabs, the Contractor is required to dispose of larger pieces of concrete.

Any repairs necessary to the subbase and adjacent slabs due to damage caused by the removal and breaking out of the concrete shall be to the Contractor's cost. If during the process of breaking out the concrete, the sawn edge of the remaining concrete is damaged beyond the repair boundary, a further pilot cut parallel to the initial cut shall be sawn without any payment to the Contractor.

After removal of the bulk concrete a final saw cut, 50 mm deep, shall be made on the boundary of the repair area, 60 mm back from the pilot cut. This remaining 60 mm vertical wedge shall be chopped out using hand tools or light pneumatic hammers with a maximum size of 14 kg in order to provide a rough vertical face for aggregate interlock load transfer.

Where saw-cuts cross over each other at corners of repair areas, the saw-cuts extending beyond the boundary of the repair shall be filled with an approved epoxy filler to the surface of the concrete pavement and the cost of such work shall be included under the rates for the repair. The Contractor shall demonstrate by means of a trial that he is able to achieve a full depth penetration of the epoxy into the saw cuts extending beyond the boundary of the repair.

Broken up concrete shall be removed from the road and road reserve and spoiled at locations arranged by the Contractor himself. No overhaul will be payable for the removal of broken up concrete or any other materials resulting from the breaking up of concrete.

#### **b) Preparation of repair area**

After the existing concrete has been removed, the repair area shall be cleaned out using oil-free compressed air to remove all dust and loosened concrete. Any partially loosened concrete that remains shall be removed by hand tools and wire brushing. The subbase shall then be examined and any loose material which has been disturbed below the desired level of clean-out, shall be removed and repaired. The disturbed area shall be neatly cut out to dimensions and depths as directed by the Engineer and the excavated cavity shall be cleaned of all loose debris. The underlying pavement layers shall be compacted if required to the satisfaction of the Engineer and the cavity backfilled with a Class 10/20 concrete and finished level with the adjacent subbase.

Where specified on the drawings, tie-bars shall be placed into the face of the existing slab. The equipment used for drilling tie-bars shall preferably be the hydraulic percussion type and the drill shall not crack or spall the adjacent concrete. Tie bar holes shall be drilled at mid-depth of the slab, and the diameter of the hole shall be a minimum of 4,0 mm, but not more than 6,0 mm, larger than the tie bar diameter as specified. A drill support system, using the pavement surface or subbase as a reference, shall be required to assure correct alignment. Hand-held drills shall not be permitted.

#### **c) Installation of tie bars**

After drilling, the tie-bar holes shall be cleaned out with compressed air prior to grouting in the tie-bars utilising an approved quick setting non-shrink epoxy. The epoxy shall be injected to the rear of the hole and shall be dispersed along its full length to ensure that the bars are completely covered and no voids exist. Lockset resin cartridge anchor systems may also be used. The bars shall be inserted with a twisting motion and seated in place by tapping. Tie-bars shall be placed parallel to the surface and centre line of the pavement for transverse joints or perpendicular to the centre line for longitudinal joints.

After placing of tie-bars the repair area shall again be cleaned out with oil free compressed air at a minimum pressure of 0,5N/mm<sup>2</sup>. The subbase shall then be sprayed with a bitumen emulsion bond breaking agent and the vertical faces of existing paving coated with bond-breaker, or wet to dry epoxy as indicated on the drawings. Wet to dry epoxy shall only be applied to a clean and dry concrete face, free of all dirt, loose material.

#### **d) Installation of dowels**

Dowels shall be positioned at the depth specified, measured from the surface level of the slab, within a tolerance of  $\pm 10$  mm. They shall be aligned parallel to the finished surface of the slab, to the centreline of the carriageway and to each other within the following tolerances:

- All dowels in a joint shall be aligned within  $\pm 2,0$  mm per 300 mm length of bar.
- No individual dowel shall differ in alignment from an adjoining bar by more than 3,0 mm per 300 mm length of bar in either the horizontal or vertical planes.
- All dowels in a joint shall be within  $\pm 4,0$  mm per 300 mm length of bar.
- No individual dowel shall differ in alignment from an adjoining bar by more than 6,0 mm per 300 mm length of bar in either the horizontal or vertical planes.
- All dowels shall be equally positioned about the intended line of the joint within a tolerance of  $\pm 25$  mm.

#### **e) Placing of Concrete**

The time intervals between sawing, concrete removal, preparation and placing new concrete shall be as short as possible in order to eliminate or reduce any potential for slab creep.

The subbase shall be damped down before the application of the wet to dry epoxy to the vertical concrete faces. The repair concrete shall be placed when the wet to dry epoxy is tacky and within the time limit stipulated by the manufacturer of the epoxy. Where high early strength concrete is required for early re-opening to traffic, the Contractor shall be required to mix the concrete as close as possible to the location of the repair area in order to avoid premature setting of the concrete prior to placing. The concrete shall be placed and evenly spread up to the level of the mesh reinforcing (were specified) as shown on the Drawings.

The mesh shall then be placed in position and the remainder of the concrete placed. The mesh shall be accurately cut to the dimensions required and shall be discontinuous at joints. The concrete shall be compacted in place by means of an internal poker vibrator particularly near the edges and corners. The surface shall be struck off at least twice with a screed flush with the existing pavement at the repair limits.

While the concrete is still plastic, the Contractor shall test the repair surface which shall be finished flush with the surrounding pavement to within a tolerance of  $\pm 3,0$  mm between the surface of the repair and a straight edge placed on the adjacent concrete surface. Where two adjacent panels are placed together across a transverse joint, transverse and longitudinal joints shall be formed by means of saw cutting as shown on the Drawings. The initial saw-cut to the joint be carried out at the correct time and depth in order to avoid shrinkage cracks developing. Initial saw-

cutting time is dependent on temperature, curing etc. and should be carried out when the concrete strength is approximately 4 MPa and when only slight ravelling of the joint occurs. The joint shall be sawed before the concrete cracks but before 24 hours after placement.

Only after the repair has been completed and gained adequate strength, shall the transverse joints be treated and re-sealed in accordance with Clause A6.1.7 of Chapter 6 as relevant.

**f) Texturing**

Texturing shall comply with the requirements of Clause A6.1.7 of Chapter 6 and shall, as far as possible, match the existing texture. Hand operated texturing devices shall be permitted with texturing commencing immediately after finishing with the burlap drag. The depth of texturing shall be between 2,0 and 4,0 mm, and the spacing of the grooves shall not be less than 12 mm and not more than 25 mm apart in a random pattern. The direction of the texturing shall be at right angles to the longitudinal axis of the pavement. The surface texture shall be applied and completed before the concrete is so hard that the surface will be torn and coarse aggregate unduly loosened during texturing.

**g) Curing**

The repair shall be cured immediately after casting by the application of an approved resin based white pigmented curing compound as prescribed in Clause A6.1.5 of Chapter 6. In order to assist accelerated curing for earlier reopening to traffic the repair shall be covered with black polythene sheeting as soon as it can be applied without damaging the surface.

In hot and dry weather conditions, the repair shall first be covered with wet hessian before covering with the polythene sheet. During cold weather or at night, the polythene sheeting shall be covered over with polystyrene sheeting or other insulation board as appropriate.

**h) Trafficking**

No traffic shall be permitted on any repaired areas until the concrete has achieved a strength of > 30 MPa and all the joints have been sealed.

## **A7.2.8 WORKMANSHIP**

### **A7.2.8.1 General**

The completed work shall exhibit no uncontrolled cracking.

### **A7.2.8.2 Level**

When measured with a 3,0 m straight edge, the difference in level between the patch and the adjacent existing pavement shall be within  $\pm 3,0$  mm.

### **A7.2.8.3 Texture**

The average depth of texture shall be between 2,0 and 4,0 mm as prescribed.

# **B7.2 REPAIR TO EXISTING JOINTS AND UNCONTROLLED CRACKS IN CONCRETE PAVEMENTS**

## **PART B: LABOUR ENHANCEMENT**

### **CONTENTS**

<b>B7.2.1</b>	<b>SCOPE</b>
<b>B7.2.2</b>	<b>DEFINITIONS</b>
<b>B7.2.3</b>	<b>GENERAL</b>
<b>B7.2.4</b>	<b>DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS</b>
<b>B7.2.5</b>	<b>MATERIALS</b>
<b>B7.2.6</b>	<b>CONSTRUCTION EQUIPMENT</b>
<b>B7.2.7</b>	<b>EXECUTION OF THE WORKS</b>
<b>B7.2.8</b>	<b>WORKMANSHIP</b>

### **B7.2.1 SCOPE**

The provisions of Part A shall apply.

### **B7.2.2 DEFINITIONS**

The provisions of Part A shall apply.

### **B7.2.3 GENERAL**

The provisions of Part A shall apply.

### **B7.2.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

The provisions of Part A shall apply.

### **B7.2.5 MATERIALS**

The provisions of Part A shall apply.

### **B7.2.6 CONSTRUCTION EQUIPMENT**

The provisions of Part A shall apply.

### **B7.2.7 EXECUTION OF THE WORKS**

The provisions of Part A shall apply.

### **B7.2.8 WORKMANSHIP**

The provisions of Part A shall apply.

# C7.2 REPAIR TO EXISTING JOINTS AND UNCONTROLLED CRACKS IN CONCRETE PAVEMENTS

## PART C: MEASUREMENT AND PAYMENT

### (i) Preamble

The tendered rate for each item shall include full compensation for providing, maintaining and decommissioning upon completion, all the plant, equipment, labour, tools, incidentals and supervision necessary to carry out the activity and construct the works under the relevant pay item, unless otherwise stated.

No extra over payment shall apply to work carried out in restricted areas for work carried out in conformance to this Chapter. The rates tendered for the payment items in this Chapter shall include full compensation for any work in restricted areas.

The requirements of Section C1.1 of Chapter 1 shall apply.

Where pay item descriptions include any wording in brackets it is an indication that contract specific information is to be inserted in the Pricing Schedule included in the Contract Documentation.

### (ii) Notes on measurement and pay items

None.

### (iii) Items that will not be measured separately

The following activities, whether required to complete the specified work or not, will not be measured and paid for separately and the Contractor shall include the cost thereof in other pay items as he deems appropriate:

1. No separate payment will be made for setting out the works.
2. No separate payment will be made for the protection or repair as required of any existing or new road furniture, structures, buildings, infrastructure or services damaged by the Contractor's activities.
3. No additional payment shall be made, nor shall any claim for additional payment be considered, for any specified work in confined or restricted areas. Any additional costs associated with working in confined or restricted areas shall be deemed to be included in the standard applicable pay items.
4. No separate payment will be made for the loading of any materials.
5. No separate payment will be made for the hauling of any materials where the material is moved over a distance of less than, and up to 1,0 km.
6. No separate payment will be made for transporting materials from commercial sources irrespective of the haul distance.
7. No separate payment will be made for the removal or any surplus material imported to complete the works.
8. For all Works performed, precautionary measures required in terms of the Occupational Health and Safety Act (Act 85 of 1993) and the latest amendments thereof as well as the latest Construction Regulations shall be deemed included in the rates tendered for the relevant products.

### (iv) Items to be measured and paid for using items specified elsewhere in the specifications

Not applicable to this Section.

### (v) Items specifically for this Section of the specifications

Item	Description	Unit
<b>C7.2.1</b>	<b>Transverse and longitudinal crack and joint repairs incorporating the following treatments</b>	
C7.2.1.1	Routing of active cracks (indicate width and depth)	metre (m)
C7.2.1.2	Routing of non-active cracks (indicate width and depth)	metre (m)
C7.2.1.3	Bevelling of one side of the crack (indicate dimension)	metre (m)
C7.2.1.4	Bevelling of both sides of the crack (indicate dimension)	metre (m)
C7.2.1.5	Saw cutting of cracks and joints in one operation (indicate depth and width)	metre (m)
C7.2.1.6	Filling joint reservoir with cementitious non-shrink grout	kilogram (kg)
C7.2.1.7	Installation of backing material in saw cut joints (to fit saw cut dimensions)	metre (m)
C7.2.1.8	Installation of cold pour sealant	litre (ℓ)

The unit of measurement of routing shall be the metre (m) of transverse, longitudinal or random cracks routed. Distinction shall be made between different widths and depths of routing.

The unit of measurement for bevelling shall be the metre (m) of bevelling undertaken at longitudinal and transverse joints and cracks. Distinction shall be made between different sizes of bevelling and for bevelling on one or both sides of joints/cracks.

The tendered rate for bevelling and routing shall include full compensation for providing the plant and equipment required and for cutting the bevels and rout grooves to the required dimensions indicated on the drawings as well as for the cleaning of the routed crack/joint by means of high pressure water jetting followed by oil free high pressure air jetting prior to the installation of the back-up material or sealant.

The tendered rate for the installation of the back-up material shall include full compensation for providing the labour and equipment required. The tendered rate shall also include for the cleaning of the joint by means of high pressure water jetting followed by oil free high pressure air jetting prior to the installation of the back-up material.

The unit of measurement of cold poured liquid sealant shall be the litre (ℓ) of cold-poured liquid sealant applied to the joint reservoir. The tendered rate for cold-poured liquid sealants shall include full compensation for the supply and delivery of the materials to the point of installation and the installation of the sealant. The tendered rate shall also include for the supply and application of joint primer to the vertical faces of the joint groove.

Item	Description	Unit
<b>C7.2.2</b>	<b>Grouting of cracks</b>	<b>metre (m)</b>

The unit of measurement shall be the linear metre of crack grouted irrespective of width, in accordance with the Specifications, and the quantity shall be the summation of individual lengths grouted measured along the line of the crack. The tendered rate shall include for the supply and mixing of the grout, pouring it into the crack, repeating the process as often as is necessary to fill the crack, and for subsequent cleaning of the slot and pavement surface of all grout.

Item	Description	Unit
<b>C7.2.3</b>	<b>Cross-stitching of longitudinal and transverse joints and cracks</b>	
C7.2.3.1	Saw cutting of slots in concrete pavement (indicate dimensions)	number (No)
C7.2.3.2	Application of wet-to-dry epoxy to vertical faces and top of existing concrete	litre (ℓ)
C7.2.3.3	Installation of 16 mm diameter deformed tie-bar (indicate length) including application of self-levelling pourable epoxy grout and 7,1 mm aggregate.	number (No)
C7.2.3.4	Filling of slot with high strength concrete Class 50/7,1 mm	cubic metre (m <sup>3</sup> )

The tendered rate for cross-stitching by means of cutting slots shall include full compensation for the saw cutting slots in the concrete pavement, excavating the concrete, cleaning of the slots by sand blasting followed by high pressure air jetting, and the removal of all waste material resulting from this procedure.

The tendered rate for the installation of the tie bars shall include full compensation for supplying, cutting, placing, holding bars in position, the application of self-levelling epoxy grout and for the 7,1 mm crushed stone aggregate placed on top of the epoxy grout.

The tendered rate for filling slots with a high strength concrete shall include full compensation for the placing of the high strength concrete, the removal of any excess material to ensure that the slots are filled flush with the concrete surface and for the curing of the high strength concrete in accordance with the manufacturer's instructions as well as texturing the concrete by burlap drag.

Item	Description	Unit
<b>C7.2.4</b>	<b>Restoration of load transfer at transverse contraction joints</b>	
C7.2.4.1	Saw cutting and preparation of slots in concrete pavement (indicate dimensions)	number (No)
C7.2.4.2	Installation of new dowel bars as specified (indicate length and diameter) including application of bond breaker on free end, end caps.	number (No)
C7.2.4.3	Filling of slot with high strength concrete Class 50/7,1 mm	number (No)

Item	Description	Unit
<b>C7.2.5</b>	<b>Pre-treating existing dowels</b>	
C7.2.5.1	Free ends in existing concrete	number (No)
C7.2.5.2	Free ends in new concrete	number (No)

The unit of measurement shall be the number of bars treated.

Item	Description	Unit
<b>C7.2.6</b>	<b>Texturing and curing the concrete pavement</b>	
C7.2.6.1	Burlap-dragged and grooved texture:	square metre (m <sup>2</sup> )
C7.2.6.2	Curing	
(a)	Paving train constructed	square metre (m <sup>2</sup> )

The unit of measurement for texturing and curing shall be the square metre of completed pavement which has received the specified surface texturing, and curing compound as specified. The quantity shall be calculated from the specified horizontal dimensions of the completed concrete surface. The tendered rate for texturing shall include full compensation for providing the plant and equipment required and for applying the specified surface texture.

The tendered rate for curing shall include full compensation for providing the curing compound and its application as specified at the specified nominal rates of application by means of an approved pressure distributor. The tendered rate shall also include compensation for spraying the curing compound in unsealed joints after the sawing has been completed.

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.2.7</b>	<b>Variation in the rate of application of the curing compound</b>	<b>litre (ℓ)</b>

The unit of measurement in respect of increases or decreases in the rate of application of the curing compound from the nominal application as specified, shall be the litre. Payment for variations shall be made as specified in Chapter 1.

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.2.8</b>	<b>Steel reinforcement in concrete pavements</b>	
C7.2.8.1	Mild steel bars	ton (t)
C7.2.8.2	High tensile steel bars	ton (t)
C7.2.8.3	Welded steel fabric	kilogram (kg)

The unit of measurement for steel bars shall be the ton of reinforcing steel in place in accordance with the drawings or as authorized.

The unit of measurement for welded steel fabric shall be the kilogram of welded steel fabric in the panels of concrete paving which require non-contiguous reinforcement as specified. The quantity shall be calculated from the area of the mesh used in accordance with the drawings or as authorized.

The tendered rates shall include full compensation for supplying, delivering, cutting, bending, welding, placing and fixing the steel reinforcement, including all tying wires, spacers and waste.

## **D7.2 REPAIR TO EXISTING JOINTS AND UNCONTROLLED CRACKS IN CONCRETE PAVEMENTS**

### **PART D: GUARANTEES AND COMPLIANCE CERTIFICATES**

#### **CONTENTS**

- D7.2.1 SCOPE**
- D7.2.2 GENERAL**
- D7.2.3 PERFORMANCE GUARANTEE REQUIREMENTS**
- D7.2.4 FUNCTIONAL PERFORMANCE ASSESSMENTS**
- D7.2.5 VISUALLY ASSESSED PROPERTIES**
- D7.2.6 INSTRUMENTALLY ASSESSED PROPERTIES**
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- D7.2.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D7.2.9 NOTIFICATION OF REMEDIAL WORK**
- D7.2.10 REMEDIAL WORKS**

No specific items in this Section.

Where applicable, details shall be provided in the Contract Documentation.

# 7.3 REMOVAL AND REINSTATEMENT OF EXISTING CONCRETE LAYERS

## CONTENTS

### PART A: SPECIFICATIONS

- A7.3.1 SCOPE
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- A7.3.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS
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- A7.3.6 CONSTRUCTION EQUIPMENT
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- A7.3.8 WORKMANSHIP

### PART B: LABOUR ENHANCEMENT

### PART C: MEASUREMENT AND PAYMENT

### PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

## A7.3 REMOVAL AND REINSTATEMENT OF EXISTING CONCRETE LAYERS

### PART A: SPECIFICATIONS

#### A7.3.1 SCOPE

This Section covers work related the removal and replacement of concrete pavements in the following instance:

- Sections where the newly placed concrete layer as completed in accordance with Chapter 6: Concrete Layers has been rejected by the Engineer as a result of poor construction, finishing or uncontrolled cracking. This work shall not be subject to any payment.
- Where isolated non-continuous panels, or part of a panel, require replacement as part of the periodic maintenance/repair of an existing pavement as described in the Contract Documentation. This work shall be subject to payment in accordance with the specifications and rates at tendered in Part C: Measurement and Payment of this Section A7.3.

Where concrete pavements have to be widened, or where long continuous sections of concrete pavement have to be replaced and the concrete can be placed with pavers, the work shall be regarded, and be measured and paid for, as new work in accordance with the requirements of Chapter 6: Concrete Layers, Part A or B as may be prescribed.

#### A7.3.2 DEFINITIONS

**Jointed Concrete Pavement (Plain JCP)** - concrete pavements that contain sufficient joints to control all expected natural cracks. All necessary cracking occurs at joints and not elsewhere in the slab. However, there may be load transfer devices (e.g., dowel bars) at transverse joints and deformed steel bars (e.g., tie bars) at longitudinal joints, which is not considered as reinforcement. There may be isolated reinforced panels (usually in the form of welded steel mesh at approximately 0,1 %, or higher, of gross slab cross-sectional area).

**Continuously Reinforced Concrete Pavement (CRCP)** - concrete pavements that include continuous longitudinal reinforcement steel typically between 0,50 and 0,70 % of the cross-sectional area of the pavement slab. They also typically include transverse reinforcing consisting of individual bars placed at approximately 1,0 m intervals.

**Aggregate** - granular material of natural, manufactured or recycled origin used in the manufacture of cemented products to the specific grade/class as defined in these specifications and the latest published version of SANS 1083, or as may be otherwise specifically specified in the Contract Documentation:

- Course aggregate – all aggregate > 5,0 mm as further defined in the latest SANS 1083 specification for the specific class of aggregate and nominal maximum aggregate size as required.
- Nominal maximum particle size (NMPS) – designated as one sieve size larger than the largest sieve to retain a minimum of 15 % of the aggregate particles.
- Fine aggregate – all aggregate fractions  $\leq$  5,0 mm and which shall consist of clean material derived from crushing competent parent rock, or naturally occurring sand conforming to SANS 1083 and any further specified requirements listed herein.

**Cement** - as defined in SANS 50197-1 for the various classes as listed.

**Cement extenders** - The following as defined in the relevant publications:

- Ground Granulated Blast Furnace Slag: As defined in SANS 55167-1

- Fly Ash: As defined in SANS 50450-1
- Silica Fume: As defined in SANS 53263-1

### **A7.3.3 GENERAL**

#### **A7.3.3.1 Quality Plan and Method Statement**

Prior to commencing with any permanent works, the Contractor shall submit a Quality Plan, for acceptance by the Engineer, detailing a complete method statement, together with all checks and hold points, relating to construction of the specified product.

#### **A7.3.3.2 Trial sections**

The initial area where the existing concrete pavement is to be removed, substrate layers repaired where required, and new concrete placed and finished, shall be regarded as a trial section. The intention is for the Contractor to demonstrate that the materials, material mix design and construction methods to be used will ensure that the final product conforms to all the relevant requirements as specified. Any work not meeting the requirements shall be removed and reinstated by the Contractor at no additional cost.

The Contractor may, unless advised of any deficiencies in the trial section, proceed with the construction of the pavement 5 days after the completion of the trial section or such earlier time as the Engineer may determine. In the event of deficiencies in the trial section, the Engineer may order the Contractor to construct a further trial section, which shall again be regarded as the initial trial section with no additional cost. The Contractor may then proceed with the construction of the pavement 5 days after the satisfactory completion and acceptance of the second or any subsequent trial section.

If the Contractor should make any alterations in the methods, processes, equipment or materials used and approved, or if he is unable to comply consistently with the specifications, the Engineer may require that a new trial section be constructed, at the Contractor's cost, before allowing the Contractor to continue with any permanent work. The intention of this Clause is to avoid any experimentation by the Contractor on the permanent work.

No additional payment shall be made for such deemed trial sections. Payment for accepted work shall be in accordance with the tendered rates once approved by the Engineer.

#### **A7.3.3.3 Weather limitations**

##### **a) Responsibility for protection**

The Contractor shall be responsible for the quality and strength of the concrete placed and for its protection. Any concrete damaged by adverse weather (e.g., any combination of high ambient temperature, low humidity, wind, rain and hail) shall be removed and replaced at the Contractor's expense.

##### **b) Protection against rain or hail**

No concrete shall be placed during rainy weather. For the concrete to be properly protected against rain and hail before it has sufficiently hardened, the Contractor shall have available at all times appropriate waterproof covers for protecting the surface of the unhardened concrete. When rain appears to be imminent, all paving operations shall cease and the Contractor shall take the necessary steps to protect the unhardened concrete. The Contractor shall be responsible for the repair of any damage to the concrete, texturing or the curing compound that may occur.

##### **c) Cold-weather paving**

All reasonable precautions shall be taken to prevent the temperature of the pavement concrete from falling below 5°C during the first 48 hours after casting. When prevailing temperatures are low, or when cold weather is forecast and there is a danger that the temperature of the freshly constructed concrete pavement will fall below the prescribed limits the Contractor shall either cease all pavement operations, or he may be permitted to proceed, provided that the Engineer is satisfied that adequate protective measures are available, and will be taken, to ensure that the temperature of the pavement will be maintained above 5°C for the period stated.

##### **d) Hot-weather paving**

When paving is done during hot weather and when the temperature of the fresh concrete can be expected to exceed 24°C, the Contractor shall implement appropriate precautionary measures to place the concrete at the coolest temperature practicable. Paving operations shall cease when the concrete temperature as discharged at the paver exceeds 32°C.

##### **e) Hot and windy weather paving**

Unless appropriate and adequate protection measures to the plastic concrete are provided, all production of concrete and paving operations shall cease when the prevailing evaporation rate, as determined in accordance with the nomograph given in Section A20.1 of Chapter 20 exceeds 1,0 kg/m<sup>2</sup>/hr.

Where provision has been made in the Pricing Schedule for the establishment of a portable weather station to be located in the immediate vicinity of the paving site and positioned at 1,0 m above the level of the pavement being constructed. During paving operations the Contractor shall provide the Engineer with all the relevant data as recorded by the weather station.

### **A7.3.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

#### **A7.3.4.1 Concrete mixes**

##### **a) Lean-mix concrete layers**

The lean mix concrete for use in the underlying subbase layer shall consist of 10 MPa concrete designed in accordance with the relevant requirements listed in Chapter 13.

## **b) Concrete layers**

The Contractor shall design the concrete mixes in accordance with all the requirements as listed in Clause A6.1.4 of Chapter 6 with the exception that, where rapid strength gain is required to permit opening to traffic within any prescribed period, rapid hardening cements/accelerating admixtures may be incorporated. The use of such shall however not absolve the Contractor from ensuring that the concrete can be delivered, placed, consolidated and finished to the specified requirements and with no drying/plastic shrinkage cracking occurring.

The mix designs shall be undertaken by an approved laboratory.

### **A7.3.4.2 Hot mix asphalt**

Where hot mix asphalt is to be used in the subbase layer beneath the concrete layer, the mix shall be designed by a competent laboratory according to the design level 1A as defined and described in Sabita Manual 35: Design of hot Mix Asphalt. The asphalt mix shall be of the sand skeletal type as defined and may be either continuously or semi-gap graded.

The mix properties shall conform to all the requirements listed for this mix type and design level, with the exception that additional binder shall be added in order to achieve a Voids in Mix (VIM) value of < 1 % and a Voids Filled with Binder (VFB) value > 90 %.

### **A7.3.4.3 Stabilised layers**

Where stabilised layers are to be used in the supporting layers, the stabilisation design shall conform to the relevant material requirements as prescribed in Chapter 4 as well as the general requirements contained in TRH 13: Stabilisation.

## **A7.3.5 MATERIALS**

### **A7.3.5.1 Concrete**

All the relevant concrete and other material requirements, as prescribed in Clause A6.1.5 of Chapter 6, shall be applicable.

### **A7.3.5.2 Hot mix asphalt**

All the relevant material requirements, as prescribed in Clause A9.1.5 of Chapter 9: Asphalt Layers, for the particular mix type shall be applicable. The binder grade shall be 50/70 complying with SANS 4001 – BT1 or the equivalent Performance Grade class.

### **A7.3.5.3 Stabilised material**

All the requirements as listed in Chapter 4 shall be applicable for the class of layer specified.

### **A7.3.5.4 Tie bars, dowel bars and reinforcing mesh**

Tie bars, dowels and reinforcing mesh shall comply with the requirements of Clause A6.1.5 of Chapter 6, as relevant. The dimensions of each type shall be as indicated in the Contract Documentation.

## **A7.3.6 CONSTRUCTION EQUIPMENT**

All construction equipment shall be suitable for the specific use and size of working area and be capable of completing all the specified construction work within the specified properties and construction tolerances.

The Contractor shall prepare the list of construction equipment required for the type and extent of repair for the specific project. The following types of construction equipment are typically required for patching:

- Pedestrian and small ride-on roller,
- Vibratory plate compactor,
- Mobile compressor with matched paving breakers,
- Mechanical saw and hand tools,
- Drilling equipment,
- Hand-operated compactor,
- Mobile concrete mixer,
- Tractor loader backhoe (TLB) or small front-end loader.
- Poker vibrators
- Vibrating levelling screeds/beams
- Any other tools and equipment necessary to complete the work in accordance with all the specified requirements

## **A7.3.7 EXECUTION OF THE WORKS**

### **A7.3.7.1 Removal of existing concrete**

Where any section of the concrete pavement has to be removed, the whole panel between longitudinal and transverse joints shall be removed, unless it is specified in the project specifications or ordered by the Engineer that only part of the panel be removed. In such cases the concrete shall be removed either over the full length or over the full width of the panel between joints. Where the edge of the section to be removed coincides with an

existing joint, the edge shall be accurately demarcated in a straight line and sawn with an approved concrete saw to a depth of at least 50 mm before the removal of the concrete may commence.

Existing concrete may be broken up by the sawing and lifting of panels, or by sawing the boundaries of the area to be removed and breaking up the internal concrete by suitable equipment. The method of removal shall be approved by the Engineer, but strict control shall be exercised to ensure that the adjacent concrete is not damaged in any way. The Contractor shall repair any damage to the adjacent concrete, at his own cost, in accordance with the instructions of the Engineer. Any remedial work may involve the partial or complete replacement of the damaged panel should it be deemed necessary by the Engineer.

Care shall be taken at existing joints to ensure that tie bars or dowels are not damaged or bent so as to render them useless. In the case of continuously reinforced concrete, the concrete shall be removed in such a manner so as to preserve the continuity of the reinforcing steel in all directions. Any discontinuity caused through removal of the concrete shall be reinstated in accordance with the Contract Documentation and approved

Broken-up concrete shall be removed to an approved spoil site.

### **A7.3.7.2 Preparing the underlying layer/s after concrete has been removed**

#### **a) Underlying layers remaining in place**

Where the underlying layer does not have to be removed or reworked after the existing concrete pavement has been removed, it shall be prepared as follows:

##### *(i) Cemented layers*

Where the layer consists of cemented material or cemented crushed stone in accordance with the classification of Chapter 4, and unless otherwise instructed by the Engineer, its surface shall be swept clean and all loose, soft or poorly cemented material shall be removed. A primer shall then be applied consisting of a stable spray grade emulsion complying with the requirements of SANS 4001 BT-3 cut back to 30 % net bitumen to result in a nominal net bitumen application rate of 0,4 l/m<sup>2</sup>. No primer may be spilt onto the existing concrete pavement.

After the primer has dried out sufficiently, the surface shall be tested for irregularities in all directions with a 3,0 m straight-edge. All holes and depressions where the surface deviates by more than 25 mm from the bottom side of the 3,0 m straight-edge shall be filled in with coarse slurry as specified in Chapter 10, with the exception that the void content in the micro surfacing shall be so designed as to produce the lowest compacted void content as possible. The micro surfacing shall be thoroughly compacted with appropriate compaction plant and finished flush with the surface of the layer. The levels of the layer shall be such that the concrete pavement constructed on it will comply with all the tolerances applicable thereto.

Dependant on the rate of quantity required, the micro surfacing may either be batched in a purpose made slurry machine or in suitable portable concrete mixers. The surface shall be fully cured and then thoroughly cleaned and dampened with water immediately before the new concrete is placed.

##### *(ii) Asphalt layers*

The layer shall be cleaned and all damaged and loose sections removed. A bond coat consisting of a stable grade emulsion complying with SANS 4001 BT- 3 cut back to 30 % net bitumen to result in a net bitumen application rate of 0,4 l/m<sup>2</sup> shall then be applied. No bond coat may be spilt onto the existing concrete pavement.

The surface shall then be tested for irregularities in all directions with a 3,0 m straight-edge, and the surface may not deviate by more than 25 mm from the bottom edge of the straight-edge at any point. Where the surface is too small for a 3,0 m straight-edge, a shorter straight-edge shall be used. All holes and depressions where the surface deviates by more than 25 mm from the bottom side of the straight-edge shall be filled in with coarse slurry as specified in Chapter 10, with the exception that the void content in the micro surfacing shall be so designed as to produce the lowest compacted void content as possible. The micro surfacing shall be thoroughly compacted with appropriate compaction plant and finished flush with the surface of the layer. The levels of the layer shall be such that the concrete pavement constructed on it will comply with all the tolerances applicable thereto.

Where so instructed by the Engineer, a further coat consisting of 30 % stable-grade bitumen emulsion complying with SANS 4001 BT shall be applied to the underlying layer immediately before the concrete is placed at a nominal net bitumen application rate of 0,4 l/m<sup>2</sup>. The emulsion shall be fully cured and the surface shall then be thoroughly cleaned immediately before the new concrete is placed.

##### *(iii) Recompaction of existing underlying pavement layers*

Where required, the Contractor shall break up and recompact existing pavement layers to the density specified in the Contract Documentation. Particular attention shall be given, and appropriate equipment provided, to ensure compliance with the compaction requirements in the corners of any excavation.

#### **b) Removal of existing underlying pavement layers**

Where existing underlying pavement layers are to be removed, the method, and associated equipment, shall be appropriate to the area of the excavation, and be such to enable the particular layers to be removed without any damage to the surface of layer to remain in place, or any layers adjacent to the excavation. The re-use of excavated material shall not be a requirement, except where it is specified in the Contract Documentation. All excavated material shall be disposed of at an approved spoil/dump site.

### **A7.3.7.3 Reinstating underlying layers during rehabilitation work**

Any underlying layer/s removed shall be replaced with layers as specified in the Contract Documentation. The requirements for each specific layer type shall be as follows.

#### **a) Gravel layers**

The replacement gravel layers shall be as indicated in the Contract Documentation. The material properties and compaction requirements shall conform to the specific class of gravel as defined in Chapters 4 and 5. Particular attention shall be given, and appropriate equipment provided, to ensure compliance with the compaction requirements in the corners of any excavation.

#### **b) Stabilised layers**

The replacement stabilised layers shall be as indicated in the Contract Documentation. The material properties and compaction levels shall conform to the relevant requirements as specified and defined in Chapters 4 and 5 for the specific class of gravel, including stabilisation and compaction

requirements. Particular attention shall be given, and appropriate equipment provided, to ensure compliance with the compaction requirements in the corners of any excavation.

Mixing in of the stabilising agent shall not be done in-situ but in appropriate mixers off the adjacent pavement as appropriate for the volume of material to be stabilised.

**c) Lean mix concrete (minimum thickness of 100 mm)**

Where the excavated subbase layer is to be reinstated with lean mix concrete, the concrete shall be mixed in appropriate batching plants or mobile concrete mixes located off any adjacent pavement surface, and then transported, placed, consolidated and finished in accordance with the requirements in Clause B6.1.7.3 of Chapter 6. Consolidation of the concrete shall be by means of appropriate poker vibrators.

**d) Hot mixed asphalt**

The asphalt shall be manufactured, delivered, placed and compacted within the temperature requirements as prescribed in Chapter 9: Asphalt Layers for the particular mix approved. Particular attention shall be given, and appropriate equipment provided, to ensure compliance with the compaction requirements in the corners of any excavation.

**e) Micro surfacing**

Micro surfacing (slurry) shall be designed, batched and placed in accordance with the relevant requirements contained in Chapter 10: Surface Treatments.

### **A7.3.7.4 Reinstatement of tie bars, dowel bars continuous reinforcing and reinforcing mesh**

**a) Tie bars**

*(i) In new concrete*

Tie bars installed across longitudinal hinge joints of panels consisting of new concrete shall be located at the spacing and depth as indicated in the Contract Documentation. Treatment and installation shall be in accordance with Clause A6.1.7 of Chapter 6.

*(ii) Between existing and new concrete*

At longitudinal hinge joints between existing and new concrete, the tie bars extruding from the existing concrete after removal of the concrete shall be cleaned and straightened and accurately aligned as specified. Existing tie bars that have been irreparably damaged or destroyed as a result of poor workmanship by the Contractor during breaking up of the existing concrete, or by the sawing and lifting out of the pavement method if so selected by the Contractor, shall be reinstated by the Contractor at no cost.

In such instances holes shall be drilled into the vertical face of the adjacent existing concrete slab at a spacing and depth equivalent to that in the existing pavement, and shall be approved by the Engineer. The material requirements shall be as prescribed in Clause A6.1.5 of Chapter 6, as relevant, and the dimensions of the bars shall be equivalent to those destroyed. The tie bars shall then be fixed into the existing concrete utilising an appropriate epoxy as approved by the Engineer and aligned prior to casting any adjacent new concrete.

Where no tie bars exist, but are required, new tie bars shall be installed as specified above and shall be provided for, as relevant, in Part C: Measurement and Payment.

Where no bars are required between the existing and new concrete but such bars do exist in the adjacent existing concrete, such bars shall be cut off flush with the concrete edge.

**b) Dowel bars**

*(i) In new concrete*

Dowel bars installed across transverse contraction joints of new concrete shall be located at the spacing and depth as indicated in the Contract Documentation. Treatment, installation and allowable tolerances shall be in accordance with Clause A6.1.7 of Chapter 6.

*(ii) Between existing and new concrete*

At transverse contraction joints, the existing dowels protruding from the face of the concrete exposed, after removal of the deficient adjacent concrete, shall be cleaned, and where required, straightened to comply with the relevant tolerances prescribed. Where the sliding end of any undamaged dowel bars occur in existing concrete, the dowel bar shall be extracted, cleaned, treated and then replaced.

Where any existing dowel bars have been irreparably damaged or severed due to the Contractor's method of breaking out the existing concrete, any deficient dowel bars shall be cut off, and new dowel bars of similar dimensions installed at locations and spacing as approved by the Engineer. No payment shall be applicable for any such associated costs. In such instances holes shall be drilled into the vertical face of the adjacent existing concrete slab at a spacing and depth equivalent to that in the existing pavement and as approved by the Engineer. The material requirements shall be as prescribed in Clause A6.1.5 of Chapter 6, as relevant, and the dimensions of the bars shall be equivalent to those destroyed. The fixed end of the dowel bars shall then be fixed into the existing concrete utilising an appropriate epoxy as approved by the Engineer and aligned prior to casting any adjacent new concrete.

In such cases, no payment shall be applicable for such reinstatement.

Where the dowel bars have been previously damaged or severed, or where the saw and lift-off method has been prescribed in the Contract Documentation, the dowel bars shall be reinstated in accordance with the drawings. Where no bars are required between the existing and new concrete but such bars do occur in the existing concrete, such bars shall be cut off flush with the concrete edge.

In such cases payment shall be applicable in accordance with Part C: Measurement and Payment.

Before concrete is placed, all the bars shall be accurately aligned as indicated on the drawings and specified in Clause A6.1.8 of Chapter 6. Where tie bars or dowels are shown on the drawings at joints between existing and new concrete, but no such bars occur in the existing concrete, holes shall be drilled in the existing concrete and fresh bars placed and fixed as prescribed in the Contract Documentation. In such cases, the dowels shall be placed with their sliding ends in the new concrete.

**c) Continuous reinforcing steel**

*(i) In new concrete*

Continuous reinforced steel shall be installed in the new concrete in accordance with the details as indicated in the Contract Documentation. Installation and allowable tolerances shall be in accordance with Clauses A6.1.6 to 8 of Chapter 6.

In such cases payment shall be applicable in accordance with Part C: Measurement and Payment.

*(ii) In existing concrete*

Where the continuous reinforcing steel in the existing CRCP pavement has been severed during excavation of the concrete by the Contractor as a result of poor workmanship or the saw and lift-off method selected by the Contractor, he shall reinstate the steel by means of splicing in accordance with drawings.

In such cases, no payment shall be applicable for such reinstatement.

Where the reinforcing steel has been previously severed, or where the saw and lift-off method has been prescribed in the Contract Documentation, the reinforcing steel shall be reinstated in accordance with the drawings.

In such cases payment shall be applicable in accordance with Part C: Measurement and Payment.

**d) Reinforcing steel mesh**

*(i) In new concrete*

Reinforcing steel mesh shall be installed in the new concrete in accordance with the details as indicated in the Contract Documentation. Installation and allowable tolerances shall be in accordance with Clauses A6.1.6 to 8 of Chapter 6.

In such cases payment shall be applicable in accordance with Part C: Measurement and Payment.

*(ii) In existing concrete*

Where the reinforcing steel mesh in the existing pavement has been severed during excavation of the concrete by the Contractor as a result of poor workmanship or the saw and lift-off method selected by the Contractor, he shall reinstate the steel by means of splicing in accordance with drawings.

In such cases, no payment shall be applicable for such reinstatement.

Where the reinforcing steel has been previously severed, or where the saw and lift-off method has been prescribed in the Contract Documentation, the reinforcing steel shall be reinstated in accordance with the drawings.

In such cases payment shall be applicable in accordance with Part C: Measurement and Payment.

**A7.3.7.5 Replacing the concrete**

Where new concrete is placed next to existing concrete, the edge of the existing pavement shall be properly cleaned and all bituminous and other jointing material shall be removed.

Where various adjacent panels are constructed, the concrete in every alternate panel shall first be placed. The concrete in the rest of the panels may be placed only after the concrete in the first panels has sufficiently hardened so that no damage will be done to the first panels during construction activities. All formwork shall remain in position for at least 24 hours.

Before concrete is placed, the underlying surface or layer shall be prepared as specified.

Except where concrete is placed in continuous lengths exceeding 50 m, placing, compacting and finishing with hand equipment shall be carried out as specified in Clause B6.1.7 of Chapter 6.

The concrete shall be placed, consolidated and finished in accordance with the requirements as prescribed in Clause B6.1.7 of Chapter 6. No traffic shall be permitted on the concrete until the compressive strength has reached a minimum of 30 MPa and all the joints have been sealed.

**A7.3.7.6 Forming of joints**

Where relevant and indicated, all joints between the existing and new concrete shall be sawn after the new concrete has hardened sufficiently to prevent spalling or other damage from occurring. The timing of such sawing will be dependent on the characteristic of the particular cement incorporated in the concrete mix but shall be such as to prevent any uncontrolled shrinkage cracking occurring. The width and depth of the sawn grooves shall comply with the requirements in the Contract Documentation.

All joints shall be formed and sealed as prescribed in Clause A6.1.7 of Chapter 6 and/or Section A7.1 as relevant. All joints shall be sealed before opening to traffic.

**A7.3.7.7 Initial texturing and curing**

**a) Texturing**

After the concrete has been placed and finished the texture shall be formed as prescribed in Clause A6.1.7.3 of Chapter 6. The pattern and depth of texturing shall be as close as possible to that existing on the adjacent existing concrete.

**b) Curing**

The curing compound shall be applied in accordance to the requirements prescribed in Clause A6.1.7.3 of Chapter 6 immediately after completing the texturing.

## **A7.3.8 WORKMANSHIP**

### **A7.3.8.1 General**

The completed work shall exhibit no uncontrolled cracking.

### **A7.3.8.2 Level and Grade**

The level tolerance on any portion of full depth fresh concrete cast between existing panels or portions thereof, shall be governed by the levels on the adjacent edges of the existing concrete. Where the fresh concrete is a portion of an existing panel the level shall be checked by a 3,0 m straight-edge placed across the existing concrete edges and the level of the fresh concrete shall not deviate by more than  $\pm 3,0$  mm from the line of the straight-edge.

Where complete panels are replaced between existing joints, the longitudinal grade tolerance of each replaced panel shall be governed by the longitudinal grade along the edge of adjacent concrete panels remaining in position. The concrete shall be finished flush with the adjacent panels and the maximum deviation from the existing longitudinal grade shall not exceed  $\pm 3,0$  mm.

For thin bonded arris and surface repairs the fresh concrete shall be finished flush with the surrounding concrete to within a tolerance of  $\pm 3,0$  mm.

### **A7.3.8.3 Thickness**

Where full depth panels or portions thereof, are replaced on top of the existing subbase layers, the nominal thickness of the concrete shall be equal to the nominal thickness of the adjacent concrete pavement.

### **A7.3.8.4 Surface Regularity**

Where single concrete panels or portions thereof are replaced between existing panels, no irregularity of more than 3,0 mm shall be measured with a rolling straight-edge or a 3,0 mm long straight-edge laid along the centre line of the road.

### **A7.3.8.5 Testing frequency**

For full-depth repairs the testing frequency for construction tolerances shall be as per the following:

- Surface Levels: 9 Random Control Points per Panel
- Width and Edge Alignment: Each Panel
- Joint Alignment: Each Panel

### **A7.3.8.6 Texture**

The average depth of texture shall be between 3,0 and 4,5 mm as prescribed.

# **B7.3 REMOVAL AND REINSTATEMENT OF EXISTING CONCRETE LAYERS**

## **PART B: LABOUR ENHANCEMENT**

### **CONTENTS**

<b>B7.3.1</b>	<b>SCOPE</b>
<b>B7.3.2</b>	<b>DEFINITIONS</b>
<b>B7.3.3</b>	<b>GENERAL</b>
<b>B7.3.4</b>	<b>DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS</b>
<b>B7.3.5</b>	<b>MATERIALS</b>
<b>B7.3.6</b>	<b>CONSTRUCTION EQUIPMENT</b>
<b>B7.3.7</b>	<b>EXECUTION OF THE WORKS</b>
<b>B7.3.8</b>	<b>WORKMANSHIP</b>

### **B7.3.1 SCOPE**

The provisions of Part A shall apply.

### **B7.3.2 DEFINITIONS**

The provisions of Part A shall apply.

### **B7.3.3 GENERAL**

The provisions of Part A shall apply.

### **B7.3.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

The provisions of Part A shall apply.

### **B7.3.5 MATERIALS**

The provisions of Part A shall apply.

### **B7.3.6 CONSTRUCTION EQUIPMENT**

The provisions of Part A shall apply.

### **B7.3.7 EXECUTION OF THE WORKS**

The provisions of Part A shall apply.

### **B7.3.8 WORKMANSHIP**

The provisions of Part A shall apply.

# C7.3 REMOVAL AND REINSTATEMENT OF EXISTING CONCRETE LAYERS

## PART C: MEASUREMENT AND PAYMENT

### (i) Preamble

The tendered rate for each item shall include full compensation for providing, maintaining and decommissioning upon completion, all the plant, equipment, labour, tools, incidentals and supervision necessary to carry out the activity and construct the works under the relevant pay item, unless otherwise stated.

No extra over payment shall apply to work carried out in restricted areas for work carried out in conformance to this Chapter. The rates tendered for the payment items in this Chapter shall include full compensation for any work in restricted areas.

The requirements of Section C1.1 of Chapter 1 shall apply.

Where pay item descriptions include any wording in brackets it is an indication that contract specific information is to be inserted in the Pricing Schedule included in the Contract Documentation.

### (ii) Notes on measurement and pay items

Not applicable.

### (iii) Items that will not be measured separately

The following activities, whether required to complete the specified work or not, will not be measured and paid for separately and the Contractor shall include the cost thereof in other pay items as he deems appropriate:

1. No separate payment will be made for setting out the works.
2. No separate payment will be made for the protection or repair as required of any existing or new road furniture, structures, buildings, infrastructure or services damaged by the Contractor's activities.
3. No additional payment shall be made, nor shall any claim for additional payment be considered, for any specified work in confined or restricted areas. Any additional costs associated with working in confined or restricted areas shall be deemed to be included in the standard applicable pay items.
4. No separate payment will be made for the loading of any materials.
5. No separate payment will be made for the hauling of any materials where the material is moved over a distance of less than, and up to 1,0 km.
6. No separate payment will be made for transporting materials from commercial sources irrespective of the haul distance.
7. No separate payment will be made for the removal or any surplus material imported to complete the works.
8. For all Works performed, precautionary measures required in terms of the Occupational Health and Safety Act (Act 85 of 1993) and the latest amendments thereof as well as the latest Construction Regulations shall be deemed included in the rates tendered for the relevant products.

### (iv) Items to be measured and paid for using items specified elsewhere in the specifications

The following items of work, when specified, shall be carried out, measured and paid for in accordance with the appropriate Sections of the specifications.

**Table C7.3-1: Payment items from other Chapters or Sections**

Activity	Section 7.3 reference	Section item reference
Loading and hauling	C7.3	C1.7 of Chapter 1 - All applicable items

### (v) Items specifically for this Section of the specifications

Item	Description	Unit
<b>C7.3.1</b>	<b>Removal of concrete in rehabilitation work</b>	
C7.3.1.1	Concrete without reinforcing	cubic metre (m <sup>3</sup> )
C7.3.1.2	Reinforced concrete	cubic metre (m <sup>3</sup> )
C7.3.1.3	Underlying layers	cubic metre (m <sup>3</sup> )

The unit of measurement shall be a cubic metre of concrete or underlying pavement layers broken up and removed to an approved spoil site. The quantity shall be determined in accordance with the authorized dimensions the particular pavement layer removed.

The tendered rate shall include full compensation for breaking up the concrete, loading, and transporting it to an approved spoil site and removing any remaining debris and cleaning the excavation as specified. No overhaul shall be applicable. The tendered rate shall also include full compensation for the protection of adjacent concrete and its repair should it be damaged.

Dowels and tie bars in existing concrete and stays used to keep the bars in position will not be regarded as reinforcing.

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.2</b>	<b>Full depth repairs using hand placed concrete with CEM I 52,5</b>	<b>cubic metre (m<sup>3</sup>)</b>

The unit of measurement shall be the cubic metre of pavement placed by hand and finished in accordance with the specifications and Drawings, and the quantity shall be the summation of the individual areas calculated by multiplying the length by the width at the top surface of the repaired panel by the average depth of the repair. The tendered rate shall include full compensation for:

- Procuring, furnishing and storage of all materials
- Provision of all plant
- Saw cutting including both pilot and final cuts
- Epoxy filling of overcuts at corners
- Breaking out and removing concrete
- Cutting existing reinforcement as required
- Preparing subbase including cleaning out and priming
- Determination of mix proportions
- Mixing, transporting, placing and finishing of the concrete, including formwork where required
- Mesh reinforcement including cutting, waste and placing
- Mechanical texturing, curing and surface protection
- Disposal of surplus material and cleaning up
- Sampling and testing

In addition, the tendered rate shall also include full compensation for the preparation of joint faces in accordance with the specifications and drawings and shall include following:

- Cleaning of joint faces
- Supply and application of bond-breaker
- Supply and application of wet to dry epoxy
- Installation of joint former where required
- Initial saw cutting for crack control where two panels are cast together
- Saw cutting for installation of silicone sealant
- Forming of central key at longitudinal construction joints
- Provision of all plant and materials
- Disposal of surplus materials and cleaning up

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.3</b>	<b>Partial Depth Repairs using hand placed fine concrete</b>	<b>cubic metre (m<sup>3</sup>)</b>

The unit of measurement shall be the square metre of partial depth repair placed by hand and finished in accordance with the Contract Documentation, and the quantity shall be the summation of the individual repair areas measured at the surface of the slab. The depth of the repair shall be a minimum of 50 mm and a maximum of 75 mm.

The tendered rate shall include full compensation for:

- Procuring, furnishing and storage of all materials
- Provision of all plant
- Sawcutting or routing
- Breaking out and removing concrete
- Cleaning surfaces
- Supply and installation of polyethylene former to transverse and longitudinal weakened plane joints
- Supply and application of wet to dry epoxy
- Supply and application of bitumen bond-breaker as required
- Determination of mix proportions
- Mixing, transporting, placing and finishing of the concrete including formwork where require
- Reforming longitudinal construction joints as required
- Sawcutting for the installation of silicone sealant
- Mechanical texturing, curing and surface protection
- Disposal of surplus material and cleaning up
- Sampling and testing

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.4</b>	<b>Tie-bars and dowels for full depth repairs</b>	
C7.3.4.1	Tie bars (indicate diameter and length)	number (No)
C7.3.4.2	Dowel bars (indicate diameter and length)	number (No)

The unit of measurement shall be the number of tie-bars or dowels placed in accordance with the Drawings or as authorised by the Engineer.

The tendered rate shall include compensation for:

- Drilling and cleaning out of tie bar and dowel holes
- Provision of all plant
- Supply and application of grout material
- Supply and application of bond breaker to dowels
- Supply, cutting and placing of tie-bars and dowels

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.5</b>	<b>Partial Depth Repairs using hand placed acrylic resin grout</b>	<b>square metre (m<sup>2</sup>)</b>

The unit of measurement shall be the square metre of partial depth repair placed by hand and finished in accordance with the specifications and drawings, and the quantity shall be the summation of the individual repair areas measured at the surface of the slab. The depth of the repair shall be a minimum of 50 mm and a maximum of 75 mm.

The tendered rate shall include full compensation for:

- Procuring, furnishing and storage of all materials
- Provision of all plant
- Sawcutting or routing
- Breaking out and removing concrete
- Cleaning surfaces
- Supply and installation of polyethylene former to transverse and longitudinal weakened-plane joints and application of any concrete primer
- Mixing, transporting, placing and finishing of the acrylic epoxy grout including formwork where required
- Reforming joints as required
- Texturing, curing and surface protection
- Disposal of surplus material and cleaning up
- Sampling and testing

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.6</b>	<b>Reinstating the subbase with lean mix concrete</b>	<b>cubic metre (m<sup>3</sup>)</b>

The unit of measurement shall be the cubic metre of lean mix concrete placed by hand and in accordance with the specifications and drawings. The quantity shall be the summation of the individual areas calculated by multiplying the length by the width at the top surface of the repaired subbase by the average depth of the repair.

The tendered rate shall include full compensation for:

- Procuring, furnishing and storage of all materials
- Provision of all plant
- Preparing roadbed including cleaning out and priming
- Determination of mix proportions
- Mixing, transporting, placing and finishing of the concrete, including formwork where required.
- Disposal of surplus material and cleaning up
- Sampling and testing

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.7</b>	<b>Removal of exposed stitches in concrete pavement</b>	<b>number (No)</b>

The unit of measurement shall be number of exposed stitches removed from the concrete pavement as indicated by the Engineer. The tendered rate shall include full compensation for widening the slot by means of saw cutting, removing the steel bar from the slot and cleaning the slot. Damage to the concrete pavement shall be at the Contractor's expense.

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.8</b>	<b>Sawing of concrete in rehabilitation works to different depths</b>	
C7.3.8.1	State depth in mm	metre (m)

The unit of measurement shall be a square metre of saw-cut in the existing concrete as approved by the Engineer and sawn to the required depth, measured once only irrespective of the number of times the sawing has to be repeated to obtain such depth. The quantity shall be the product of the authorized length and depth of the saw-cut.

The tendered rate shall include full compensation for demarcating the saw line, providing and applying water and other material, and for sawing the concrete to the satisfaction of the Engineer.

This item shall not apply to the sawing of joints.

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.9</b>	<b>Removal of existing supporting layers in rehabilitation work</b>	
C7.3.9.1	Granular material	cubic metre (m <sup>3</sup> )
C7.3.9.2	Cemented material	cubic metre (m <sup>3</sup> )
C7.3.9.3	Asphalt material	cubic metre (m <sup>3</sup> )

The unit of measurement shall be a cubic metre of concrete or underlying pavement layers broken up and removed to an approved spoil site. The quantity shall be determined in accordance with the authorized dimensions the particular pavement layer removed.

The tendered rate shall include full compensation for breaking up the material, loading, and transporting it to an approved spoil site as well as removing any remaining debris and cleaning the excavation as specified. No overhaul shall be applicable. The tendered rate shall also include full compensation for the protection of adjacent concrete and its repair should it be damaged.

Dowels and tie bars in existing concrete and stays used to keep the bars in position will not be regarded as reinforcing.

Item	Description	Unit
<b>C7.3.10</b>	<b>Preparing the underlying layers after the concrete has been removed</b>	
C7.3.10.1	Re-compaction of remaining underlying layers	square metre (m <sup>2</sup> )
C7.3.10.2	Replacement of granular layers (material class and thickness indicated)	square metre (m <sup>2</sup> )
C7.3.10.3	Replacement of stabilised layers (material class and thickness indicated)	square metre (m <sup>2</sup> )
C7.3.10.4	Replacement of supporting layers with 10 MPa lean mix concrete (material class and thickness indicated)	square metre (m <sup>2</sup> )
C7.3.10.5	Replacement of subbase with hot mix asphalt (thickness indicated)	ton (t)
C7.3.10.6	Levelling the surface with coarse slurry (micro surfacing)	cubic metre (m <sup>3</sup> )

The unit of measurement shall be a square metre, cubic metre or ton, as relevant, of existing underlying layer prepared in accordance with the requirements. The quantity shall be computed in accordance with the authorized dimensions of the prepared layer, or weigh bridge certificates as relevant for asphalt.

The tendered rate shall include full compensation for preparing the layer in accordance with the specified requirements, testing for level, cleaning the edge of the existing concrete and for removing any remaining loose material and waste.

Item	Description	Unit
<b>C7.3.11</b>	<b>Reinstatement of concrete layers (Excluding texturing and curing)</b>	
C7.3.11.1	Replacement of concrete in JCP pavements (thickness indicated)	square metre (m <sup>2</sup> )
C7.3.11.2	Replacement concrete in CRCP pavements (thickness indicated)	square metre (m <sup>2</sup> )
<b>C7.3.12</b>	<b>Pre-treating existing dowels</b>	
C7.3.12.1	Free ends in existing concrete	number (No)
C7.3.12.2	Free ends in new concrete	number (No)

The unit of measurement shall be the number of bars treated.

Item	Description	Unit
<b>C7.3.13</b>	<b>Texturing and curing the concrete pavement</b>	
C7.3.13.1	Burlap-dragged and texture (indicate groove or broom finish)	square metre (m <sup>2</sup> )
C7.3.13.2	Curing	square metre (m <sup>2</sup> )

The unit of measurement for texturing and curing shall be the square metre of completed pavement which has received the specified surface texturing, and curing compound as specified. The quantity shall be calculated from the specified horizontal dimensions of the completed concrete surface. The tendered rate for texturing shall include full compensation for providing the plant and equipment required and for applying the specified surface texture.

The tendered rate for curing shall include full compensation for providing the curing compound and its application as specified at the specified nominal rates of application by means of an approved pressure distributor. The tendered rate shall also include compensation for spraying the curing compound in unsealed joints after the sawing has been completed.

Item	Description	Unit
<b>C7.3.14</b>	<b>Variation in the rate of application of the curing compound</b>	litre (ℓ)

The unit of measurement in respect of increases or decreases in the rate of application of the curing compound from the nominal application as specified, shall be the litre. Payment for variations shall be made as specified in Chapter 1.

Item	Description	Unit
<b>C7.3.15</b>	<b>Steel reinforcement in concrete pavements</b>	
C7.3.15.1	Mild steel bars	ton (t)
C7.3.15.2	High tensile steel bars	ton (t)

The unit of measurement for steel bars shall be the ton of reinforcing steel in place in accordance with the drawings or as authorized.

The unit of measurement for welded steel fabric shall be the kilogram of welded steel fabric in the panels of concrete paving which require non-contiguous reinforcement as specified. The quantity shall be calculated from the area of the mesh used in accordance with the drawings or as authorized.

The tendered rates shall include full compensation for supplying, delivering, cutting, bending, welding, placing and fixing the steel reinforcement, including all tying wires, spacers and waste.

<b>Item</b>	<b>Description</b>	<b>Unit</b>
<b>C7.3.16</b>	<b>Temporary Partial Depth Repairs using Asphalt Materials</b>	<b>square metre (m<sup>2</sup>)</b>

The unit of measurement shall be the square metre of repair at joint or surface spalling carried out in accordance with the specifications and Drawing, and the quantity shall be the summation of the individual repair areas measured at the surface of the slab. The depth of the repair shall be a minimum of 50 mm and a maximum of 75 mm.

The tendered rate shall include full compensation for:

- Provision of all plant and materials
- Cleaning surfaces
- Supply and placing of hot or cold asphalt

The excavation and preparation of the repairs shall be paid for under C7.3.10.

## **D7.3 REMOVAL AND REINSTATEMENT OF EXISTING CONCRETE LAYERS PART D: GUARANTEES AND COMPLIANCE CERTIFICATES**

### **CONTENTS**

- D7.3.1 SCOPE**
- D7.3.2 GENERAL**
- D7.3.3 PERFORMANCE GUARANTEE REQUIREMENTS**
- D7.3.4 FUNCTIONAL PERFORMANCE ASSESSMENTS**
- D7.3.5 VISUALLY ASSESSED PROPERTIES**
- D7.3.6 INSTRUMENTALLY ASSESSED PROPERTIES**
- D7.3.7 EVALUATION FOR ACCEPTANCE**
- D7.3.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D7.3.9 NOTIFICATION OF REMEDIAL WORK**
- D7.3.10 REMEDIAL WORKS**

No specific items in this Section.

Where applicable, details shall be provided in the Contract Documentation.

# 7.4 REINSTATEMENT OF SLAB SUPPORT BY GROUT INJECTION

## CONTENTS

### PART A: SPECIFICATIONS

- A7.4.1 SCOPE
- A7.4.2 DEFINITIONS
- A7.4.3 GENERAL
- A7.4.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS
- A7.4.5 MATERIALS
- A7.4.6 CONSTRUCTION EQUIPMENT
- A7.4.7 EXECUTION OF THE WORKS
- A7.4.8 WORKMANSHIP

### PART B: LABOUR ENHANCEMENT

### PART C: MEASUREMENT AND PAYMENT

### PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

## A7.4 REINSTATEMENT OF SLAB SUPPORT BY GROUT INJECTION

### PART A: SPECIFICATIONS

#### A7.4.1 SCOPE

This Section covers the work requirements for reinstatement of concrete pavement support by sub-sealing utilising grout injection. It also includes for the jacking of concrete slabs to reinstate riding quality in areas of subgrade settlement and or faulting.

#### A7.4.2 DEFINITIONS

**Sub-sealing** - the filling of voids under the concrete pavement as a result of hydraulic erosion or other causes.

**Slab jacking** - the lifting of panels that have settled in order to reinstate ride quality.

#### A7.4.3 GENERAL

##### A7.4.3.1 Weather conditions

Sub sealing or slab jacking shall only be undertaken when the ambient temperature is 5°C and rising, and shall cease when the temperature exceed 30°C.

#### A7.4.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS

##### A7.4.4.1 Cement Grout Mixes

###### a) Grout Material

###### (i) Cementitious materials

Cementitious materials used for the grout shall comply with the following standards:

- Cement – SANS 50197-1. The cement type and class incorporated in the grout mix shall be appropriate to the setting times required
- Ground Granulated Blast Furnace Slag - SANS 55167-1
- Fly ash - SANS 50450-1
- Silica fume - SANS 53263-1

###### (ii) Water

Water for use in the grout with SANS 51008. The requirements of Chapter 13 shall also apply.

The dry materials shall be accurately measured by weight or volume. If delivered in bulk they shall be packaged in bags of uniform volume. The water shall be batched through an appropriate meter capable of measuring the day's consumption.

(iii) **Grout**

The grout material shall consist of the following:

- 1 part (by volume) CEM I cement
- 3 parts (by volume) Pozzolan or fly ash
- Sufficient water to achieve required fluidity

If ambient temperature is below 12°C an accelerator may be used subject to approval of the Engineer. Consideration of the time required prior to opening the pavement to traffic shall be necessary.

**b) Design process**

The Contractor shall submit a design mix for materials and additives to be used as specified in this Clause. The mix design shall include physical and chemical analysis for the pozzolans and tests of the grout slurry by an approved laboratory showing one day, three day, and seven day strengths, flow cone times, shrinkage and expansion observed and time of initial test. The seven day compressive strength shall not be less than 4,0 MPa. The test specimens shall consist of the materials (including water and admixtures) which are to be used in the project.

**c) Fluidity**

Fluidity of the grout slurry shall be measured by the Corps of Engineers Flow Cone Method as per their specification CRD-C 611-80. Time of efflux for pozzolanic grouts shall range from 16 to 26 seconds. A more fluid mix having a flow cone time of efflux of 9 to 15 seconds should be used during the initial injection at each hole. These measurements shall be made not less than twice each day.

**d) Grout for sealing of injection holes**

Injection holes for sub-sealing and slab jacking shall be sealed with a cementitious grout as approved by the Engineer.

### **A7.4.4.2 Polyurethane foam**

**a) Grout Material**

Polyurethane grout shall consist of two chemicals that combine to form a strong lightweight foam-like substance.

**b) Design process**

The Contractor shall submit a design for the foam indicating density of in excess of 64 kg/m<sup>3</sup> and a strength in excess of 0,25 MPa.

**c) Grout for sealing of injection holes**

Injection holes for sub-sealing and slab jacking shall be sealed with a cementitious grout as approved by the Engineer.

## **A7.4.5 CONSTRUCTION EQUIPMENT**

The Contractor shall furnish all equipment necessary or incidental to the adequate performance and acceptable completion of the work as follows:

### **A7.4.5.1 Cement Grout**

**a) Grout plant**

The grout plant shall consist of a positive displacement cement injection pump capable of applying 2 MPa pressure, a high-speed colloidal mixing machine and a grout return system. The colloidal mixing machine shall operate at a minimum speed of 800 RPM, maximum speed to 2000 RPM, creating a high-shearing action and subsequent pressure release to produce a homogeneous mixture.

**b) Water tanker**

If water tanker and pumps are not an integral part of the plant, water shall be supplied from a water truck with adequate capacity and pressure for delivery to the grout plant.

**c) Drilling equipment**

An air compressor and rock drills or other device capable of drilling the grout injection holes 38 to 50 mm diameter through the concrete pavement and stabilised subbase materials shall be required. The equipment shall be in good condition and operated in such manner that the holes are vertical and not "cut-of-round". Down-feed pressure whether by hand or mechanical means shall not exceed 90 kg maximum downward pressure. Holes shall be drilled in such a manner so as to prevent breakout at the bottom of the pavement.

In addition a coring machine shall be provided to take cores through the pavement and to drill pilot holes to prevent breakout on the concrete pavement surface.

**d) Transport**

Transport required for the transportation of all materials, equipment and personnel required for the sub-sealing of the concrete pavement must comply with all safety requirements and regulations applicable to vehicles operating on public roads.

**e) Miscellaneous**

All necessary hoses, valving and valve manifolds, positive cut-off and bypass provisions to control pressure and volume, pressure gauges and gauge protectors, expanding packers and hoses to provide positive seal during grout injection, wood plugs, hole washing tools, steel drills and bits shall be provided by the Contractor.

## **A7.4.5.2 Polyurethane Foam**

### **a) Plant**

When using polyurethane foam, all material is stored, proportioned, and blended within a self-contained pumping unit. All handling and usage of these materials should be in accordance with the material manufacturer's instructions and specifications.

### **b) Drilling equipment**

For polyurethane slab stabilization, hand-held electric-pneumatic rock drills are typically used to drill the injection holes. For these procedures, the maximum hole diameter should not exceed 15 mm.

In addition a coring machine shall be provided to take cores through the pavement and to drill pilot holes to prevent breakout on the concrete pavement surface.

### **c) Transport**

Transport required for the transportation of all materials, equipment and personnel required for the sub-sealing of the concrete pavement must comply with all safety requirements and regulations applicable to vehicles operating on public roads.

### **d) Miscellaneous**

All necessary hoses, valving and valve manifolds, positive cut-off and bypass provisions to control pressure and volume, pressure gauges and gauge protectors, expanding packers and hoses to provide positive seal during grout injection, wood plugs, hole washing tools, steel drills and bits shall be provided by the Contractor.

## **A7.4.6 EXECUTION OF THE WORKS**

### **A7.4.6.1. Drilling holes**

Holes for injection shall be drilled in a pattern determined by the Engineer in consultation with the Contractor. Holes shall be between 50 mm and 60 mm in diameter for cement grout and 15 mm diameter for polyurethane. They shall be drilled vertically and round and to a depth sufficient to penetrate through the stabilised subbase but not more than 75 mm into the subgrade. Down-feed pressure, whether by hand or mechanical means, shall be drilled in such a manner so as to prevent breakout at the bottom of the concrete pavement.

### **A7.4.6.2 Washing of holes**

Holes shall be briefly washed to create a small cavity to allow for the initial spread of grout.

### **A7.4.6.3 Sub-sealing**

The purpose of slab stabilization is to fill existing voids and not to raise the slab. Close inspection is required by the contractor and the inspector during the stabilisation operation, as lifting of the slabs can create additional voids and may lead to slab cracking. The success of the slab stabilisation operations is highly dependent upon the skill of the contractor.

The grout injection should start with a low pumping rate and pressure and should be pumped until one of the following conditions occurs:

- The maximum allowable pressure of 0,69 MPa at the grout plant is obtained. Note that a short surge up to 1,38 MPa can be allowed when starting to pump in order for the grout to penetrate the void structure, if necessary.
- The slab lift exceeds 3,0 mm.
- Grout is observed flowing from adjacent holes, cracks, or joints.
- Grout is being pumped unnecessarily under the shoulder, as indicated by lifting.
- More than about 1 minute has elapsed (any longer than this indicates the grout is flowing into a cavity).

The uplift for any given slab corner should be monitored using a modified Benkelman Beam or other similar device that is capable of detecting 0,025 mm of uplift movement.

The effectiveness of slab stabilization can be determined only by monitoring the subsequent performance of the pavement. The best early indication of effectiveness is obtained by measuring slab deflections before and after grouting to determine if the magnitude of the deflection has been significantly reduced by the process. If the retesting still indicates a loss of support, the slabs should be regouted using new drilled holes. If voids are still present after three attempts to stabilize the slab, other methods of repair should be considered (e.g., full-depth repair).

### **A7.4.6.4 Slab-jacking**

Procedures must be developed to monitor the raising of the slab and to ensure that the profile meets the desired grade. The taut stringline method is an excellent way to not only control the pumping sequence, but also to achieve the proper grade.

In the stringline method, small wooden blocks, 19 mm (0,75 in) high, are set on the pavement surface along the outer and inner edges and a stringline is secured at least 3,0 m (10 ft) from each end of the depression. As material pumping proceeds, the exact amount of rise at each point within the sag can be observed, allowing the pumping at specific holes to be carefully controlled. This method can consistently achieve profiles within tolerances of 6,0- to 9,0 mm (0,25- to 0,38 in).

- After all preliminary work has been completed (holes drilled, relief opening cut if needed), the pavement is ready to be raised. The slab must be raised only a very small amount at each hole at a time. A good rule is not to raise a slab more than 6,0 mm (0,25 in) while pumping in any one hole. No portion of the slab should be more than 6,0 mm (0,25 in) higher than any other part of the slab (or an adjacent slab) at any time. The entire working slab and all those adjacent to it must be kept in the same plane, within 6,0 mm (0,25 in), throughout the entire operation to avoid cracking.
- Pumping should be done over the entire section so that no great strain is developed at any one place. If, for example, pumping was started at either end of a dip, the tension on the top surface will be increased, and the slab will undoubtedly crack. However, if pumping is started at the middle where the tension is on the lower surface, lifting will tend to reduce it, and the slab can be raised an appreciable amount without any damage. As the section is brought back to its original profile, the pumping is extended farther and farther in either direction until the entire dip is at the desired elevation.

- Care must be taken not to flatten the middle out completely. This will cause a sharp bend and will cause cracking. The middle section naturally must be raised faster than the ends of the dip, but lifting should be conducted in such a manner as to avoid sharp bends.

#### **A7.4.6.5 Sealing of injection holes**

In the case of cement grouting, After grouting has been completed at any one hole, the packer (expanding rubber used to seal the open space between the grout injection pipe and the hole) shall be removed and the hole plugged immediately with a tapered wooden plug. These plugs are only temporary and can be removed once the grout has set sufficiently to prevent back pressure from forcing the grout through the hole. Each hole must be permanently sealed flush with the pavement surface with a cementitious grout or other material approved by the Engineer.

#### **A7.4.6.6 Loss of grout**

Excessive loss of grout/polyurethane during the sub-sealing and slab-jacking operations through other injection holes, joints and cracks or the sides of the pavement shall not be paid for.

#### **A7.4.6.7 Unanticipated conditions**

In the event of the Engineer determines that continued injection at any specific location due to major voids is no longer economically feasible, he should direct the Contractor to cease injection at the location. The Contractor will be paid at the unit price for the material used up to that point.

#### **A7.4.6.8 Changed conditions**

The Engineer, at his discretion, may delete any location or may add a new location to be sub-sealed or slab-jacked (raised). Variation in the plan quantity at any specific location will not be considered cause for renegotiation of the unit prices.

#### **A7.4.6.9 Finishing**

All loose concrete, joint filler or grout/foam accidentally or otherwise spilled on the surface of the concrete pavement or on the adjoining gravel shoulder/median and any other construction waste material shall be removed and the surrounding areas shall be left in a neat and orderly condition by the Contractor prior to final acceptance of the work.

### **A7.4.7 WORKMANSHIP**

#### **A7.4.7.1 Level and Grade**

The level tolerance on any portion of full depth fresh concrete cast between existing panels or portions thereof, shall be governed by the levels on the adjacent edges of the existing concrete. Where the fresh concrete is a portion of an existing panel the level shall be checked by a 3,0 m straight-edge placed across the existing concrete edges and the level of the fresh concrete shall not deviate by more than  $\pm 3,0$  mm from the line of the straight-edge.

Where complete panels are replaced between existing joints, the longitudinal grade tolerance of each replaced panel shall be governed by the longitudinal grade along the edge of adjacent concrete panels remaining in position. The concrete shall be finished flush with the adjacent panels and the maximum deviation from the existing longitudinal grade shall not exceed  $\pm 3,0$  mm.

For thin bonded arris and surface repairs the fresh concrete shall be finished flush with the surrounding concrete to within a tolerance of  $\pm 3,0$  mm.

#### **A7.4.7.2 Thickness**

Where full depth panels or portions thereof, are replaced on top of the existing subbase layers, the nominal thickness of the concrete shall be equal to the nominal thickness of the adjacent concrete pavement.

#### **A7.4.7.3 Surface Regularity**

Where single concrete panels or portions thereof are replaced between existing panels, no irregularity of more than 3,0 mm shall be measured with a rolling straight-edge or a 3,0 mm long straight-edge laid along the centre line of the road.

#### **A7.4.7.4 Testing frequency**

For full-depth repairs the testing frequency for construction tolerances shall be as per the following:

- Surface Levels: 9 Random Control Points per Panel
- Width and Edge Alignment: Each Panel
- Joint Alignment: Each Panel

# **B7.4 REINSTATEMENT OF SLAB SUPPORT BY GROUT INJECTION**

## **PART B: LABOUR ENHANCEMENT**

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<b>B7.4.1</b>	<b>SCOPE</b>
<b>B7.4.2</b>	<b>DEFINITIONS</b>
<b>B7.4.3</b>	<b>GENERAL</b>
<b>B7.4.4</b>	<b>DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS</b>
<b>B7.4.5</b>	<b>MATERIALS</b>
<b>B7.4.6</b>	<b>CONSTRUCTION EQUIPMENT</b>
<b>B7.4.7</b>	<b>EXECUTION OF THE WORKS</b>
<b>B7.4.8</b>	<b>WORKMANSHIP</b>

### **B7.4.1 SCOPE**

The provisions of Part A shall apply.

### **B7.4.2 DEFINITIONS**

The provisions of Part A shall apply.

### **B7.4.3 GENERAL**

The provisions of Part A shall apply.

### **B7.4.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

The provisions of Part A shall apply.

### **B7.4.5 MATERIALS**

The provisions of Part A shall apply.

### **B7.4.6 CONSTRUCTION EQUIPMENT**

The provisions of Part A shall apply.

### **B7.4.7 EXECUTION OF THE WORKS**

The provisions of Part A shall apply.

### **B7.4.8 WORKMANSHIP**

The provisions of Part A shall apply.

# C7.4 REINSTATEMENT OF SLAB SUPPORT BY GROUT INJECTION

## PART C: MEASUREMENT AND PAYMENT

### (i) Preamble

The tendered rate for each item shall include full compensation for providing, maintaining and decommissioning upon completion, all the plant, equipment, labour, tools, incidentals and supervision necessary to carry out the activity and construct the works under the relevant pay item, unless otherwise stated.

No extra over payment shall apply to work carried out in restricted areas for work carried out in conformance to this Chapter. The rates tendered for the payment items in this Chapter shall include full compensation for any work in restricted areas.

The requirements of Section C1.1 of Chapter 1 shall apply.

Where pay item descriptions include any wording in brackets it is an indication that contract specific information is to be inserted in the Pricing Schedule included in the Contract Documentation.

### (ii) Notes on measurement and pay items

None.

### (iii) Items that will not be measured separately

The following activities, whether required to complete the specified work or not, will not be measured and paid for separately and the Contractor shall include the cost thereof in other pay items as he deems appropriate:

1. No separate payment will be made for setting out the works.
2. No separate payment will be made for the protection or repair as required of any existing or new road furniture, structures, buildings, infrastructure or services damaged by the Contractor's activities.
3. No additional payment shall be made, nor shall any claim for additional payment be considered, for any specified work in confined or restricted areas. Any additional costs associated with working in confined or restricted areas shall be deemed to be included in the standard applicable pay items.
4. No separate payment will be made for the loading of any materials.
5. No separate payment will be made for the hauling of any materials where the material is moved over a distance of less than, and up to 1,0 km.
6. No separate payment will be made for transporting materials from commercial sources irrespective of the haul distance.
7. No separate payment will be made for the removal or any surplus material imported to complete the works.
8. For all Works performed, precautionary measures required in terms of the Occupational Health and Safety Act (Act 85 of 1993) and the latest amendments thereof as well as the latest Construction Regulations shall be deemed included in the rates tendered for the relevant products.

### (iv) Items to be measured and paid for using items specified elsewhere in the specifications

Not applicable to this Section.

### (v) Items specifically for this Section of the specifications

Item	Description	Unit
C7.4.1	Sub-sealing of the concrete pavement	number of 50 kg cement pockets

The unit of measurement shall be the number of 50 kg pockets of cement used to complete the sub-sealing operation. The tendered rate shall include full compensation for supplying all the equipment and incidentals necessary to carry out the sub-sealing operation complete and shall include for all pozzolans, fly ash, water and admixtures used in the grout mixture.

The tendered rate shall also include for the cleaning of the pavement surface of all debris and grout spillage, wooden plugs and the sealing of joints and other openings where the grout may escape. The tendered rate shall also include full compensation for supplying all equipment, materials and incidentals required to drill the holes, cleaning and monitoring the holes and to fill the holes with a suitable cement/fine aggregate mix after the sub-sealing operation has been completed.

## **D7.4 REINSTATEMENT OF SLAB SUPPORT BY GROUT INJECTION**

### **PART D: GUARANTEES AND COMPLIANCE CERTIFICATES**

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- D7.4.1 SCOPE**
- D7.4.2 GENERAL**
- D7.4.3 PERFORMANCE GUARANTEE REQUIREMENTS**
- D7.4.4 FUNCTIONAL PERFORMANCE ASSESSMENTS**
- D7.4.5 VISUALLY ASSESSED PROPERTIES**
- D7.4.6 INSTRUMENTALLY ASSESSED PROPERTIES**
- D7.4.7 EVALUATION FOR ACCEPTANCE**
- D7.4.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D7.4.9 NOTIFICATION OF REMEDIAL WORK**
- D7.4.10 REMEDIAL WORKS**

No specific items in this Section.

Where applicable, details shall be provided in the Contract Documentation.

# 7.5 REINSTATEMENT OF RIDING QUALITY

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### PART A: SPECIFICATIONS

- A7.5.1 SCOPE
- A7.5.2 DEFINITIONS
- A7.5.3 GENERAL
- A7.5.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS
- A7.5.5 MATERIALS
- A7.5.6 CONSTRUCTION EQUIPMENT
- A7.5.7 EXECUTION OF THE WORKS
- A7.5.8 WORKMANSHIP

### PART B: LABOUR ENHANCEMENT

### PART C: MEASUREMENT AND PAYMENT

### PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

## A7.5 REINSTATEMENT OF RIDING QUALITY

### PART A: SPECIFICATIONS

#### A7.5.1 SCOPE

This Section covers the work required to reinstate the smoothness/riding quality of concrete pavements.

#### A7.5.2 DEFINITIONS

**Smoothness/riding quality** – as measured by appropriate methods depending on the area/s being assessed, and may include:

- 3,0 m straight edge
- Rolling straight edge
- Direct Contact Roughness Measuring Devices
- High Speed Inertial Non-Contact Laser Profilometers

#### A7.5.3 GENERAL

In this Section, distinction is made as follows:

- Work required on newly placed concrete as a result of poor workmanship not meeting the required specifications
- Work required as a result of deficiencies in the existing concrete surface

In the case of poor workmanship, no payment for this work, including traffic accommodation and any additional riding quality measurements ordered by the Engineer, shall be applicable.

#### A7.5.4 DESIGN BY THE CONTRACTOR / PERFORMANCE BASED SYSTEMS

Not applicable

#### A7.5.5 MATERIALS

Not applicable

#### A7.5.6 CONSTRUCTION EQUIPMENT

Grinding shall be performed using diamond blades mounted on a self-propelled machine designed for grinding and texturing pavement. The grinding equipment shall be at a minimum 35,000 pounds including the grinding head, and of a size that will grind a strip at least 3 feet wide. The

effective wheel base of the machine shall be no less than 12 feet. The effective wheel base is defined as the distance from the front wheel assembly transverse pivot point to the transverse pivot point of the profile/depth control/ ground drive wheels.

The equipment shall have a positive means of vacuuming the grinding residue from the pavement surface, leaving the surface in a clean, near-dry condition.

Grinding equipment that causes raveling, aggregate fractures or disturbance to the joints shall not be permitted. The equipment shall be maintained to ensure it is in proper working order.

The grinding process shall produce a pavement surface that is true in grade and uniform in appearance with longitudinal line-type texture. The line-type texture shall contain corrugations parallel to the outside pavement edge and present a narrow ridge corduroy type appearance. The peaks of the ridges shall be 3,0 mm +/- 1,5 mm higher than the bottom of the grooves with evenly spaced ridges.

Slurry shall be collected, processed and disposed of.

## **A7.5.7 EXECUTION OF THE WORKS**

### **A7.5.7.1 Areas to be treated as a result of poor workmanship in new concrete**

Where the smoothness of newly placed concrete does not meet the relevant specified requirements, the Contractor shall grind the surface utilising appropriate equipment. If the grinding is carried out with 14 days of initial placing, new curing compound shall be applied as prescribed in Clause A6.1.7.3 of Chapter 6.

The areas to be ground shall be identified by the Contractor and sufficiently improved so as to meet all the final smoothness requirements as specified.

No payment shall be applicable for these operations.

### **A7.5.7.2 Areas to be treated as a result of smoothness deficiencies in the existing concrete.**

Where the smoothness of the existing surface is poor as a result of settlement, faulting or any other reason, the affected areas shall be ground to meet the required tolerances as specified. The areas to be treated and level of smoothness required shall be as specified in the Contract Documentation and as directed by the Engineer.

Payment for grinding shall be in accordance with Part C: Measurement and Payment.

The areas to be treated shall be as indicated in the Contract Documentation and as directed by the Engineer. Depending on the depth of grinding required, and the equipment being utilised, it may be necessary to apply more than one pass of the grinding machine to achieve the specified requirements.

## **A7.5.8 WORKMANSHIP**

After completion of the grinding, the finished surface shall comply with all the smoothness requirements as specified in Clause A6.1.8 of Chapter 6 as relevant, or any other requirement as may be specified in the Contract Documentation.

# **B7.5 REINSTATEMENT OF RIDING QUALITY**

## **PART B: LABOUR ENHANCEMENT**

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<b>B7.5.1</b>	<b>SCOPE</b>
<b>B7.5.2</b>	<b>DEFINITIONS</b>
<b>B7.5.3</b>	<b>GENERAL</b>
<b>B7.5.4</b>	<b>DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS</b>
<b>B7.5.5</b>	<b>MATERIALS</b>
<b>B7.5.6</b>	<b>CONSTRUCTION EQUIPMENT</b>
<b>B7.5.7</b>	<b>EXECUTION OF THE WORKS</b>
<b>B7.5.8</b>	<b>WORKMANSHIP</b>

### **B7.5.1 SCOPE**

The provisions of Part A shall apply.

### **B7.5.2 DEFINITIONS**

The provisions of Part A shall apply.

### **B7.5.3 GENERAL**

The provisions of Part A shall apply.

### **B7.5.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

The provisions of Part A shall apply.

### **B7.5.5 MATERIALS**

The provisions of Part A shall apply.

### **B7.5.6 CONSTRUCTION EQUIPMENT**

The provisions of Part A shall apply.

### **B7.5.7 EXECUTION OF THE WORKS**

The provisions of Part A shall apply.

### **B7.5.8 WORKMANSHIP**

The provisions of Part A shall apply.

## C7.5 REINSTATEMENT OF RIDING QUALITY

### PART C: MEASUREMENT AND PAYMENT

#### (i) Preamble

The tendered rate for each item shall include full compensation for providing, maintaining and decommissioning upon completion, all the plant, equipment, labour, tools, incidentals and supervision necessary to carry out the activity and construct the works under the relevant pay item, unless otherwise stated.

No extra over payment shall apply to work carried out in restricted areas for work carried out in conformance to this Chapter. The rates tendered for the payment items in this Chapter shall include full compensation for any work in restricted areas.

The requirements of Section C1.1 of Chapter 1 shall apply.

Where pay item descriptions include any wording in brackets it is an indication that contract specific information is to be inserted in the Pricing Schedule included in the Contract Documentation.

#### (ii) Notes on measurement and pay items

None.

#### (iii) Items that will not be measured separately

The following activities, whether required to complete the specified work or not, will not be measured and paid for separately and the Contractor shall include the cost thereof in other pay items as he deems appropriate:

1. No separate payment will be made for setting out the works.
2. No separate payment will be made for the protection or repair as required of any existing or new road furniture, structures, buildings, infrastructure or services damaged by the Contractor's activities.
3. No additional payment shall be made, nor shall any claim for additional payment be considered, for any specified work in confined or restricted areas. Any additional costs associated with working in confined or restricted areas shall be deemed to be included in the standard applicable pay items.
4. No separate payment will be made for the loading of any materials.
5. No separate payment will be made for the hauling of any materials where the material is moved over a distance of less than, and up to 1,0 km.
6. No separate payment will be made for transporting materials from commercial sources irrespective of the haul distance.
7. No separate payment will be made for the removal or any surplus material imported to complete the works.
8. For all Works performed, precautionary measures required in terms of the Occupational Health and Safety Act (Act 85 of 1993) and the latest amendments thereof as well as the latest Construction Regulations shall be deemed included in the rates tendered for the relevant products.

#### (iv) Items to be measured and paid for using items specified elsewhere in the specifications

Not applicable to this Section.

#### (v) Items specifically for this Section of the specifications

Item	Description	Unit
C7.5.1	Grinding of existing concrete pavement surfaces	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of surface treated. The tendered rate shall include full compensation for establishing the appropriate equipment on site, grinding as required and disposing all removed material and or debris from the site to an approved spoil site.

## **D7.5 REINSTATEMENT OF RIDING QUALITY**

### **PART D: GUARANTEES AND COMPLIANCE CERTIFICATES**

#### **CONTENTS**

- D7.5.1 SCOPE**
- D7.5.2 GENERAL**
- D7.5.3 PERFORMANCE GUARANTEE REQUIREMENTS**
- D7.5.4 FUNCTIONAL PERFORMANCE ASSESSMENTS**
- D7.5.5 VISUALLY ASSESSED PROPERTIES**
- D7.5.6 INSTRUMENTALLY ASSESSED PROPERTIES**
- D7.5.7 EVALUATION FOR ACCEPTANCE**
- D7.5.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D7.5.9 NOTIFICATION OF REMEDIAL WORK**
- D7.5.10 REMEDIAL WORKS**

No specific items in this Section.

Where applicable, details shall be provided in the Contract Documentation.

# 7.6 REINSTATEMENT OF SURFACE TEXTURE

## CONTENTS

### PART A: SPECIFICATIONS

- A7.6.1 SCOPE
- A7.6.2 DEFINITIONS
- A7.6.3 GENERAL
- A7.6.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS
- A7.6.5 MATERIALS
- A7.6.6 CONSTRUCTION EQUIPMENT
- A7.6.7 EXECUTION OF THE WORKS
- A7.6.8 WORKMANSHIP

### PART B: LABOUR ENHANCEMENT

### PART C: MEASUREMENT AND PAYMENT

### PART D: GUARANTEES AND COMPLIANCE CERTIFICATES

## A7.6 REINSTATEMENT OF SURFACE TEXTURE

### PART A: SPECIFICATIONS

#### A7.6.1 SCOPE

This Section covers all work in connection with the retexturing of a concrete pavement surface by means of grooving the concrete surface in the transverse direction perpendicular to the centre line of the road.

#### A7.6.2 DEFINITIONS

**Texture/mean profile depth** – consisting of randomly spaced grooves formed in fresh concrete or sawn into hardened concrete normally 3,0 to 5,0 mm in depth.

#### A7.6.3 GENERAL

In this Section, distinction is made as follows:

- Work required on newly placed concrete as a result of poor workmanship not meeting the required specifications
- Work required as a result of deficiencies in the existing concrete surface

In the case of poor workmanship, no payment for this work, including traffic accommodation and any additional texture depth measurements required, shall be applicable.

#### A7.6.4 DESIGN BY THE CONTRACTOR / PERFORMANCE BASED SYSTEMS

Not applicable

#### A7.6.5 MATERIALS

Not applicable

#### A7.6.6 CONSTRUCTION EQUIPMENT

Self-propelled machines with multi-blade arbors utilising diamond blades built for grinding and/or retexturing purposes. Each machine is to be equipped with a depth control device to ensure that the grooving depth is maintained, as well as a device to control the alignment. Governing machine speed is required to maintain an even depth.

The sawing equipment shall be appropriate for the depth of texturing required and surface area to be treated. The blades utilised shall be 3,0 mm in thickness and so configured so as to provide grooves at random spacing 12 to 25 mm apart.

## **A7.6.7 EXECUTION OF THE WORKS**

### **A7.6.7.1 Areas to be treated as a result of poor workmanship in new concrete**

Where the texture depth of newly placed concrete is too shallow or irregular, and does not meet the relevant specified requirements, the Contractor shall saw grooves into the pavement surface utilising appropriate equipment. The surface texture shall then be reinstated to the specified depth of 3,0 to 5,0 mm. If the texture sawing is carried out on the surface within 14 days of initial placing, new curing compound shall be applied as prescribed in Clause A6.1.7.3 of Chapter 6. The areas to be retextured, as identified by the Engineer, shall be treated by the Contractor so as to meet all the final texture requirements as specified.

No payment shall be applicable for these operations.

### **A7.6.7.2 Areas to be treated as a result of texture deficiencies in the existing concrete.**

Where the texture of the existing surface is inadequate as a result of abrasion, or any other reason, the identified areas shall be retextured to meet the required tolerances as specified. The areas to be treated and texture depth required shall be as specified in the Contract Documentation and as directed by the Engineer.

Payment for retexturing shall be in accordance with Part C: Measurement and Payment.

### **A7.6.7.3 General requirements**

All residue or slurry resulting from the texturing operation be removed continuously. The pavement shall be left in a clean washed condition immediately after the operation and no slurry shall be allowed to flow over lanes open to traffic, or into the drainage system

In order to improve the surface drainage texturing shall be done up to the edge of the pavement to enable surface water to run off the pavement completely.

A guide line shall be required to be set at the start of each section to ensure that grooves are perpendicular to the centre line of the road. Where horizontal curves are encountered it is necessary to set out guide wires at 2,0 m intervals.

## **A7.6.8 WORKMANSHIP**

The average depth of the grooves, as measured with a tyre tread depth gauge, shall be 4,0 mm and within the range of 3,0 to 5,0 mm and at a random spacing between 12 and 25 mm.

Groove depth is the most important component that needs to be evaluated constantly, of importance in this respect is machine speed. At high speeds blades tend to lift out of the concrete and shallow groove depths are obtained.

A minimum of 3 measurements per lane at random positions will be taken with a digital calliper at hourly intervals. The average depth, standard deviation and coefficient of variation for every sample will be taken.

Allowable tolerances shall be as follows:

Groove width: 3,5 mm  $\pm$ 0,5 mm

Groove depth: 4,5 mm  $\pm$ 1,5 mm

# **B7.6 REINSTATEMENT OF SURFACE TEXTURE**

## **PART B: LABOUR ENHANCEMENT**

### **CONTENTS**

<b>B7.6.1</b>	<b>SCOPE</b>
<b>B7.6.2</b>	<b>DEFINITIONS</b>
<b>B7.6.3</b>	<b>GENERAL</b>
<b>B7.6.4</b>	<b>DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS</b>
<b>B7.6.5</b>	<b>MATERIALS</b>
<b>B7.6.6</b>	<b>CONSTRUCTION EQUIPMENT</b>
<b>B7.6.7</b>	<b>EXECUTION OF THE WORKS</b>
<b>B7.6.8</b>	<b>WORKMANSHIP</b>

### **B7.6.1 SCOPE**

The provisions of Part A shall apply.

### **B7.6.2 DEFINITIONS**

The provisions of Part A shall apply.

### **B7.6.3 GENERAL**

The provisions of Part A shall apply.

### **B7.6.4 DESIGN BY CONTRACTOR / PERFORMANCE BASED SYSTEMS**

The provisions of Part A shall apply.

### **B7.6.5 MATERIALS**

The provisions of Part A shall apply.

### **B7.6.6 CONSTRUCTION EQUIPMENT**

The provisions of Part A shall apply.

### **B7.6.7 EXECUTION OF THE WORKS**

The provisions of Part A shall apply.

### **B7.6.8 WORKMANSHIP**

The provisions of Part A shall apply.

## C7.6 REINSTATEMENT OF SURFACE TEXTURE

### PART C: MEASUREMENT AND PAYMENT

#### (i) Preamble

The tendered rate for each item shall include full compensation for providing, maintaining and decommissioning upon completion, all the plant, equipment, labour, tools, incidentals and supervision necessary to carry out the activity and construct the works under the relevant pay item, unless otherwise stated.

No extra over payment shall apply to work carried out in restricted areas for work carried out in conformance to this Chapter. The rates tendered for the payment items in this Chapter shall include full compensation for any work in restricted areas.

Any prime cost or provisional sums shall be paid in accordance with the provisions of the conditions of contract. The charge or mark-up tendered or allowed for is a percentage of the amount actually paid under the prime cost or provisional sum. This percentage shall cover all the Contractor's handling, supervision, profit and liability costs to provide the services in the prime cost or provisional sum item.

The requirements of Section C1.1 of Chapter 1 shall apply.

Where pay item descriptions include any wording in brackets it is an indication that contract specific information is to be inserted in the Pricing Schedule included in the Contract Documentation.

#### (ii) Notes on measurement and pay items

None.

#### (iii) Items that will not be measured separately

The following activities, whether required to complete the specified work or not, will not be measured and paid for separately and the Contractor shall include the cost thereof in other pay items as he deems appropriate:

1. No separate payment will be made for setting out the works.
2. No separate payment will be made for the protection or repair as required of any existing or new road furniture, structures, buildings, infrastructure or services damaged by the Contractor's activities.
3. No additional payment shall be made, nor shall any claim for additional payment be considered, for any specified work in confined or restricted areas. Any additional costs associated with working in confined or restricted areas shall be deemed to be included in the standard applicable pay items.
4. No separate payment will be made for the loading of any materials.
5. No separate payment will be made for the hauling of any materials where the material is moved over a distance of less than, and up to 1,0 km.
6. No separate payment will be made for transporting materials from commercial sources irrespective of the haul distance.
7. No separate payment will be made for the removal or any surplus material imported to complete the works.
8. For all Works performed, precautionary measures required in terms of the Occupational Health and Safety Act (Act 85 of 1993) and the latest amendments thereof as well as the latest Construction Regulations shall be deemed included in the rates tendered for the relevant products.

#### (iv) Items to be measured and paid for using items specified elsewhere in the specifications

Not applicable to this Section.

#### (v) Items specifically for this Section of the specifications

Item	Description	Unit
C7.6.1	Retexturing of concrete surfaces (transverse or longitudinal)	square metre (m <sup>2</sup> )

The unit of measurement shall be a square metre of saw-cut texturing in the existing concrete surface according to the groove specifications, measured once only irrespective of the number of times the sawing has to be repeated to obtain such depth.

The tendered rate shall include full compensation for demarcating the saw line, providing equipment and applying water or any other material. The rate shall also include for the protection of the adjacent road verge and subsequent disposal of the paste at an approved spoil site.

## **D7.6 REINSTATEMENT OF SURFACE TEXTURE**

### **PART D: GUARANTEES AND COMPLIANCE CERTIFICATES**

#### **CONTENTS**

- D7.6.1 SCOPE**
- D7.6.2 GENERAL**
- D7.6.3 PERFORMANCE GUARANTEE REQUIREMENTS**
- D7.6.4 FUNCTIONAL PERFORMANCE ASSESSMENTS**
- D7.6.5 VISUALLY ASSESSED PROPERTIES**
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- D7.6.7 EVALUATION FOR ACCEPTANCE**
- D7.6.8 ADDITIONAL PROCEDURES TO BE ADOPTED IN THE EVENT OF FAILURE**
- D7.6.9 NOTIFICATION OF REMEDIAL WORK**
- D7.6.10 REMEDIAL WORKS**

No specific items in this Section.

Where applicable, details shall be provided in the Contract Documentation.