



Registration No: 1998/009584/06

# **THE SOUTH AFRICAN NATIONAL ROADS AGENCY LIMITED**

## **STANDARD SPECIFICATION FOR ROUTINE ROAD MAINTENANCE**

**OCTOBER 2001**

**VOLUME 2**

### **ISSUED BY:**

**THE CHIEF EXECUTIVE OFFICER  
SOUTH AFRICAN NATIONAL ROADS AGENCY LIMITED  
P O BOX 415  
PRETORIA  
0001**



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# STANDARD SPECIFICATION FOR ROUTINE ROAD MAINTENANCE

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Unless inconsistent with the context, in these specifications, the following terms, words or expressions shall have the meanings hereby assigned to them.

**M0101 BORROW AREA**

An area within designated boundaries, approved for the purposes of obtaining borrow material. A borrow pit is the excavated pit in a borrow area.

M0102	<b>BORROW MATERIAL</b>
	Any gravel, sand, soil, rock or ash obtained from borrow areas, dumps or sources other than cut within the road prism and which is used in the construction of the works. It shall not include crushed stone or sand obtained from commercial sources.
M0103	<b>BRIDGE</b>
	A structure erected over a depression, river, watercourse, railway line, road or other obstacle for carrying motor, railway, pedestrian or other traffic or services and having a length of 6m or more, measured between the abutment faces along the centre line of the road at girder-bed level, except that road-over-rail or rail-over-road structures are always classed as bridges.
M0104	<b>CARRIAGEWAY</b>
	The surface normally traversed by vehicles and which consists of one or a number of contiguous traffic lanes, including auxiliary lanes and shoulders.
M0105	<b>CATCHWATER DRAIN OR BANK</b>
	A longitudinal drain or bank outside the road prism for diverting water that would otherwise flow onto the road prism.
M0106	<b>CONTRACTOR'S EQUIPMENT</b>
	All apparatus, machinery, vehicles and other things required for the execution and completion of the Works and the remedying of any defects. However, Contractor's equipment excludes temporary works, Employer's equipment (if any), equipment, materials and any other things intended to form or forming part of the Permanent Works.
M0107	<b>COST</b>
	All expenditure reasonably incurred (or to be incurred) by the Contractor, whether on or off the Site, including overhead and similar charges, but does not include profit.
M0108	<b>CULVERT</b>
	A structure other than a bridge, which provides an opening under the carriageway or median for drainage or other purposes.
M0109	<b>CUT</b>
	Cut shall mean all excavations from the road prism, including side drains, excavations for crossroads, interchanges and, where classified as cut, excavations for open drains.
M0110	<b>DEBRIS AND LITTER</b>
	Debris and litter is defined as all foreign articles which, <i>inter alia</i> , shall include litter, branches, split levels, concentrated piles of refuse, animal carcasses, dangerous objects, stones larger than 75mm but smaller than 300mm, tyres and stripped tyre treads, posters and illegal signs less than 0,5m <sup>2</sup> , spilled loads, concentrated piles of refuse, animal carcasses, branches, trees, dangerous objects and accident debris.
M0111	<b>EDGE BREAK</b>
	Edge break is defined as the failure of the edge of the surfacing up to a minimum width of 300mm from the continuous edge of surfacing.
M0112	<b>EMERGENCY SERVICES</b>
	Emergency services means the police service, fire and rescue services, ambulance services or any other emergency service provided.

M0113	EMERGENCY WORKS	Any repair needed without delay for the purpose of ensuring public safety, relieving unnecessary traffic congestion, or maintaining structural integrity of a part of the road.
M0114	EMERGENCY STANDBY TEAM	<p>The team will assist with emergency accidental events to normalise, restore or safeguard any dangerous area in order for the safe passage of any traffic using the road.</p> <p>The team will be on 24-hour standby and located optimally to minimise the responding time for emergencies on weekdays, weekends and public holidays</p>
M0115	GENERAL CONDITIONS OF CONTRACT	The appropriate edition of the General Conditions of Contract for Construction issued by FIDIC (International Federation of Consulting Engineers), together with any special conditions of contract forming part of the contract.
M0116	GENERAL MOWING AND REMOVAL OF GRASS	General mowing is the cutting of planted or natural grasses and vegetation by means of mechanical mowers or by hand along the main carriageway in the boundaries of the road reserve including waterways outside the fence; intersections and the road reserve of cross roads up to the limits of the South African National Roads Agency responsibility. It includes the removal of the grass cuttings by means of mechanical balers or by hand.
M0117	GOODS	Contractor's equipment, materials, plant and temporary works, or any of them as appropriate.
M0118	INLET AND OUTLET DRAINS	Channels leading into or discharging from culverts, stormwater conduits and minor bridges.
M0119	MARKER BOARDS	Marker boards (where applicable) are placed next to the shoulder of the road and all distances are horizontally measured along the centreline of the road.
M0120	MATERIALS	Things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the contract.
M0121	MEDIAN DRAIN	A longitudinal drain situated between the inner shoulders of a dual carriageway.
M0122	MITRE DRAIN AND BANK	A drain constructed at an angle to the centre line of the road to divert water from a side drain. Mitre drains include mitre banks placed across the side drains.
M0123	NOMINATED SUBCONTRACTOR	A nominated Subcontractor means a Subcontractor who is stated in the contract as being a nominated Subcontractor, or whom the Engineer, under Clause 13 (Variations and Adjustments) of the FIDIC, Conditions of Contract for Construction, 1999, instructs the Contractor to employ as a Subcontractor.

M0124	PAVEMENT FAILURES	
		Pavement failure consists of a combination of rutting, cracking and displacement of the road surface and base layer usually accompanied by disintegration of the surfacing.
M0125	PLANT	
		The apparatus, machinery and vehicles intended to form or forming part of the Permanent Works.
M0126	POTHOLE	
		Potholes are surface failures, which extend into the base layer forming a hole. Normally such failures would be less than 0,5m <sup>2</sup> in area, are isolated and are not associated with displacement.
M0127	ROAD RESERVE	
		The entire area included by the boundaries of a road as proclaimed. It includes the intersections and the road reserve of cross roads as described in the Project Specifications.
M0128	REPAIR	
		Repair means all action required in rectifying a defect.
M0129	RESPONSE TIME	
		Response time is defined as the period from the time of which an instruction is received by the Contractor from the Engineer, to the time of reporting at an indicated place.
M0130	ROUTINE ROAD MAINTENANCE	
		Routine road maintenance means the ongoing works and activities performed or to be performed to ensure public safety, repair any defects or maintain the required condition of the site.
M0131	SERVICES	
		Cables, pipes or other structures to provide <i>inter alia</i> , conduits for electricity, telephone and telegraph connections, water, sewage and gas.
M0132	SHOULDER	
	(a)	Paved shoulder: The surfaced area between the outside edge of the travelled way and the shoulder breakpoint.
	(b)	Gravel shoulder: The upper pavement layer lying between the outside edge of the base and the shoulder breakpoint.
M0133	SHOULDER BREAKPOINT	
		The line along which the extended flat planes of the surface of the shoulder and the outside slope of the fill and pavement intersect. This edge is normally rounded to a predetermined radius.
M0134	SHOULDER MOWING AND REMOVAL OF GRASS	
		Shoulder mowing is the cutting of planted or natural grasses and vegetation by means of mechanical mowers or by hand. Shoulder mowing is limited to the cutting of strips adjacent to the road surface, grassed side drains, culvert inlets and outlets, areas around trees and shrubs, the median, interchanges and the road reserve of cross roads up to the limits of the South African National Roads Agency responsibility. It includes the removal of the grass cuttings by means of mechanical balers or by hand.



M0135	SIDE DRAIN	An open longitudinal drain situated adjacent to and at the bottom of cut or fill slopes.
M0136	SITE	The places where the Permanent Works are to be executed and to which Plant and Materials are to be delivered, and any other places as may be specified in the contract as forming part of the site.
M0137	SPOIL (MATERIAL)	Material originating from construction operations and which is not utilised for construction purposes.
M0138	SUBSOIL DRAINAGE SYSTEM	A system of subsoil drainage pipes (including any permeable material) constructed to intercept and remove subsoil water.
M0139	SURFACE FAILURES	<p>Surfacing failure often proceeded by map or diamond-like cracking is the breaking up of only the surfacing layer (seal or asphalt) exposing but not affecting the underlying layer. The resulting depression is usually of uniform thickness.</p> <p>Surfacing failures are defined as being 2m<sup>2</sup> or less in area. Surface failures exceeding 2m<sup>2</sup> in area shall be considered to be pavement failures.</p>
M0140	TRAFFIC SAFETY OFFICER	Competent member of the Contractor's staff which is nominated to act as a Traffic Safety Officer with specific responsibilities to ensure that the temporary traffic accommodation requirements comply with the specifications.
M0141	VERGE	The area between the outer edge of the road prism and the boundary of the road reserve.
M0142	WATERWAY STRUCTURE	A structure is classified as a waterway structure when the inlet area of the structure is bigger than 5m <sup>2</sup> .

**SERIES M0000 : GENERAL**

**SECTION M0200 : GENERAL REQUIREMENTS AND PROVISIONS**

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### M0201 SCOPE

This section covers matters, which relate to a routine road maintenance contract as a whole. Definitions, phrases or wording which would otherwise require repetition in other sections of the specifications are also covered by clauses in this section. Matters covered by the FIDIC Conditions of Contract for Construction, 1999 are not repeated in this section, except where necessary for providing more detailed information.

### M0202 SERVICES

The moving and relocation of existing utility services shall not be required under a Routine Road Maintenance Contract.

The positions of existing underground utility services are normally marked with appropriate markers but the Contractor shall ascertain from the Engineer before the commencement of any excavation through the road prism or in the road reserve whether underground services exist in the vicinity of the excavation.

The Contractor shall take all necessary reasonable precautions to protect known underground services as well as existing overhead services during the execution of maintenance activities. The Contractor will be held responsible and liable for any damage caused to known services, unless proof is provided that all reasonable precautions were taken and that the damage caused was as a direct result of the position of the service deviating by more than one metre from that of the position reasonably deduced from investigations made.

No payment will be made for inconvenience to the Contractor due to services crossing the site or

any authority working on such services, nor will delays caused by such work be accepted as a basis for claiming an extension of time for completing the works.

#### M0203 PROGRAMME

Due to the nature of maintenance work, certain items of work shall be carried out as a matter of routine. In certain emergency cases, the Contractor will be called upon to do remedial work at very short notice, in which case the Contractor shall proceed to carry out the work without delay and report to the Engineer in writing as soon as practically possible on the extent of the work carried out.

Apart from emergency items of work and items of work ordered by the Engineer from time to time, the Contractor shall in terms of Subclause 8.3 of the FIDIC Conditions of Contract for Construction, 1999 submit to the Engineer for approval a programme showing the order of procedure and method in which proposals are put forward to carry out the maintenance work which are of a routine nature.

The Contractor shall base the programme of work on the information included in the contract documents.

The Contractor shall submit, at the end of each month or at the monthly meeting, a detailed programme for the next three months to follow. The detailed programme shall include ad hoc activities and work not of routine nature. With the detailed programme the Contractor will submit a breakdown of the cash flow on a monthly basis.

The Engineer's approval of any programme shall have no contractual significance other than that the Engineer would be satisfied if the work was carried out according to such programme and that the Contractor undertakes to carry out the work in accordance with the programme, nor shall it limit the right of the Engineer to instruct the Contractor to vary the programme should circumstances necessitate it. The above shall not be taken as limiting of the Contractor's right to claim for damages which may be fairly entitled to in terms of the FIDIC Conditions of Contract for Construction, 1999 for delay or disruption of activities.

#### M0204 WORKMANSHIP AND QUALITY CONTROL

The onus rests with the Contractor to produce work which conforms in quality and accuracy of detail to all the requirements of the specifications and the drawings at the Contractor's own expense, institute a quality control system and provide experienced engineers, foremen, surveyors, materials technicians, other technicians and other technical staff, together with all transport, instruments and equipment, to ensure adequate supervision and positive control of the works at all times.

The Contractor shall determine the frequencies at which quality or process control tests are to be undertaken. The Engineer will, however, undertake acceptance control tests for the judgement of workmanship and quality of products without accepting any responsibilities vested with the Contractor in terms of the contract.

The cost of all supervision and process control, including testing, so carried out by the Contractor shall be deemed to be included in the rates tendered for the related items of work, except that the cost of certain tests and the provision of certain items of testing and sampling equipment shall be paid for separately as provided for in those sections of the specifications where this applies.

On completion of every part of the work and submission thereof to the Engineer for examination, the Contractor shall submit to the Engineer the results of all relevant tests, measurements and levels indicating compliance with the specified requirements.

#### M0205 SETTING-OUT OF WORK AND PROTECTION OF BEACONS

The Contractor's attention is drawn to the requirements of Subclause 4.7 of the FIDIC Conditions of Contract for Construction, 1999 and shall also comply with all legal provisions with regard to surveying and setting out of work.

The Engineer shall reference all positions of road surface repairs, existing roadmarkings, drainage structures and side drains and any roadside furniture.

Where setting out is required, the Engineer will point out the relevant beacons, NRB beacons, benchmarks, pegs and end of road reserve pegs at intersections to the Contractor. The Contractor will check that they have not been disturbed and are true with regard to position and level and maintained them to be in a satisfactory condition. If beacons have been destroyed, disturbed or damaged, the Engineer will arrange to have new beacons installed. A beacon that has been disturbed shall not be used unless its true position and level has been re-established and the Engineer has verified the new values.

Setting out shall not be measured and paid for directly and compensation for the work involved in setting out shall be deemed to be covered by the rates tendered and paid for the various items of work included under the contract.

## M0206 NOTICES, SIGNS AND ADVERTISEMENTS

The Contractor shall not erect any signs, notices or advertisements on or along the works or the site of the works without the written approval of the Engineer.

The Contractor shall supply and erect contract information signs at each end of the works on approved locations as specified or as shown on the drawings.

A special payment item is incorporated in the Schedule of Quantities relating to payment for the signboards.

These signs are to be erected not later than one month after the Contractor has been given access to the site.

The signboards shall be painted with the legend in English.

No signboards other than those specified above will be permitted on or adjacent to the works, except that the Contractor may permit each Subcontractor to display one signboard of less than 2m<sup>2</sup> at the Contractor's works office.

The Engineer shall have the right to have any sign, notice or advertisement moved to a better position or to have it removed from the site of the works if it should in any way prove unsatisfactory, inconvenient or dangerous to the general public.

The Contractor, upon completion of the works, shall remove all advertisements, notices and temporary signs.

## M0207 MEASUREMENT

### (a) Units of measurements

All work shall be measured in accordance with the SI system of metric units.

### (b) Schedule of Quantities

The quantities set out in the Schedule of Quantities are estimated quantities and are used for the comparison of tenders in awarding the contract. It must be clearly understood that only the actual quantities of work done or materials supplied shall be measured for payment, and that the scheduled quantities may be increased or decreased as necessary.

### (c) Measurement of completed work

- (i) All distances along the centre line of a road are horizontal distances and these distances will be used in calculating the quantities of fill, pavement layers and shoulders, for payment purposes. Marker boards are generally

placed at 200m intervals on the side of the road. All cross-sections shall be taken in a vertical plane. The Contractor shall take cross-sections, where necessary, for determining quantities of completed work. Cross-sections shall be submitted to the Engineer for approval before finalising quantities.

- (ii) All materials, which are specified to be measured in the vehicle, shall be hauled in vehicles of such type and size that the actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle shall bear a plainly legible identification mark indicating its specific approved capacity.
- (iii) The quantity of bituminous and similar materials to be paid by volume shall be measured at the temperature of application.
- (iv) Structures shall be measured to the neat lines shown on the drawings, including any changes ordered in writing by the Engineer, and shall include any reinforcing steel and minor ducts up to 150mm in diameter.

## M0208 PAYMENT

### (a) Contract rates

In computing the final contract amount, payments shall be based on actual quantities of authorised work carried out in accordance with the specifications and drawings. The tendered rates shall apply, subject to the provisions of the FIDIC Conditions of Contract for Construction, 1999 irrespective of whether the actual quantities are more or less than the Schedule of Quantities.

Where the Contractor has entered no rate or price against a pay item in the Schedule of Quantities, it shall be interpreted to mean that the Contractor does not require any compensation for such work. Where, however, a pay item described in these specifications or in the Project Specifications does not appear in the Schedule of Quantities, the Contractor will receive reasonable compensation for such work if required, unless anything to the contrary has been determined elsewhere.

### (b) Rates to be inclusive

The Contractor shall accept the payment provided in the contract and represented by the rates tendered by him in the Schedule of Quantities, as payment in full for executing and completing the work as specified, for procuring, furnishing, placing and installing all materials, for procuring and providing labour, supervision, tools and equipment, for wastage, transport, loading and off-loading, handling, maintenance, temporary work, testing, quality control including process control, overheads, profit, risk and other obligations and for all other incidentals necessary for the completion of the work. Value Added Tax (VAT) shall be excluded from the tendered rates and sums and provided for as a lump sum in the summary of the Schedule of Quantities.

The Contractor shall note that the cost of all work and materials for minor construction details that are inherently necessary for the proper execution of the work item and as such, are not described in the Schedule of Quantities shall be included in the tendered rate for the work item.

This Clause shall be applicable in full to all pay items, except where these requirements may have been specifically amended in any case.

### (c) Meaning of certain phrases in payment clauses

- (i) "Supply, procuring and furnishing .....(pay item mentioned) material"

Where any of the words "supply", "procure" or "furnish" (material) are used in the description of a pay item, it shall mean the supply and delivery to the

point of use of all materials of any kind required for the work covered by the particular pay item, including all tax, purchase costs, claims, damages, royalties and transport costs involved, but excluding overhaul. In the case of borrow materials, stone and sand, it shall also include all negotiations with the owners concerned, excavating, producing, preparing, processing, testing, hauling and delivering the material to the point of use, as well as the construction, repair, maintenance and making good after completion of all access roads, and all work required for opening, using and finishing off borrow pits, which is not covered by other pay items in the Schedule of Quantities.

(ii) "Placing material"

The phrase "placing material" shall mean the off-loading, spreading, blending, processing, watering, mixing, shaping and compacting (where specified) of the material in the road prism, subbase, base, shoulders, banks and bypasses, as well as the procurement, furnishing, application and admixing of water; breaking down oversize material, removing oversize material which cannot be broken down, correcting irregular or uneven surfaces or deficient thickness, finishing off to within the specified tolerances, refilling test holes and maintaining the completed work. In the case of asphalt courses and bituminous treatments, it shall also mean the heating and spraying of binder, spreading of aggregate or asphalt mixture, rolling, compacting, finishing off to within the specified tolerances and maintaining the completed work.

The phrase "procuring, furnishing and placing" shall mean "procuring and furnishing" in addition to "placing", all as defined above.

(d) Pay items

The descriptions under the pay items in the various sections of the specifications, indicating the work to be allowed for in the tendered rates for such pay items, are for the guidance of the Contractor and do not necessarily repeat all the details of work and material required by and described in the specifications.

These descriptions shall be read in conjunction with the relevant specifications and drawings and the Contractor shall, when tendering, allow for the process to be inclusive, as specified in Subclause (b) above.

(e) Materials on site

In terms of Subclause 14.5 of the FIDIC Conditions of Contract for Construction, 1999 payments for materials on site will be authorised only upon submission of documented proof that ownership of the materials is vested in the Contractor, either in the form of receipted invoices or in the form of a certificate to that effect from the supplier.

Unless otherwise stated in the special provisions of contract, the payments for materials on site will be for 80% of the value of such material.

(f) Provisional sums

The Schedule of Quantities may contain certain provisional sums so designated and entered as a preliminary allowance to cover the cost of work, materials, goods or services to be provided by the Contractor but which have not been fully specified or measured, or to cover the cost of unforeseen items of work or contingent expenditure for which no rates are applicable but for which the Contractor is to be paid according to the applicable provisions of the contract.

Work done under a provisional item shall only be executed upon a written order by the Engineer, which order shall also specify the method of payment. The expenditure in respect of a provisional item for work ordered by the Engineer shall be entirely at the Engineer's discretion and any final expenditure in respect of a provisional item may be more, less or equivalent to the amount provided in the Schedule of Quantities.

Payment as specified in the order given by the Engineer shall be according to Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999.

No expenditure will be authorised without three quotations and the written approval of the Engineer.

The mark-up fee on any provisional sum item, shall include full compensation for all overheads, profit, management, supervision, handling and other costs incurred for the work done or services provided. The fee shall be paid on the value of the work done or services provided excluding Value Added Tax (VAT).

(g) Rate only items

Opposite an item in the Schedule of Quantities where no quantity is given but a "rate only" is required, the Contractor shall fill in a rate or price which will constitute payment for any work which may be done under this item. Such a "rate only" item is used where it is estimated that little or no work will be required under the item, or where the item is to be considered as an alternative for another item where a quantity is given, or for variations in rates of application or mix proportions.

(h) Payment certificates

With reference to Subclause 14.3 and 14.6 of the FIDIC Conditions of Contract for Construction, 1999 the Contractor must submit his Payment Certificate each month. Details of the format are available from the Employer. The Employer has an electronic data capturing programme available that may be used by the Contractor, at his own risk, to prepare the payment certificate in the required format. Any cost arising from the use of the programme, cost of duplicating and delivering copies of the certificate to the Engineer and the Employer shall be borne by the Contractor. The Engineer and the Employer require a total of one (1) original and three (3) sets of A4-sized paper copies.

M0209 TAKING-OVER CERTIFICATE OF THE WORKS

The taking-over certificate of the works in terms of Clause 10 of the FIDIC Conditions of Contract for Construction, 1999 will be issued only if the following sections of the works as may be applicable have, *inter alia*, been duly completed:

- (a) Maintenance of pavement layers and road surfacing, including roadmarkings and installation or cleaning of road studs where applicable.
- (b) Maintenance of aboveground and subsoil drainage structures, drains and channels.
- (c) Maintenance of fencing.
- (d) Maintenance of roadside furniture.
- (e) Maintenance of vegetation, plants, trees, shrubs and grass.
- (f) Maintenance of bridge structures.
- (g) Any responsibility towards emergency assistance.

- (h) Erection of new road signs and repair or cleaning of existing road signs.

M0210 CONTRACTOR'S ACTIVITIES IN RESPECT OF PROPERTY OUTSIDE THE ROAD RESERVE AND OTHER DESIGNATED AREAS

- (a) The Contractor shall not enter upon private or government land outside the proclaimed road reserves and other designated areas for the purpose of the contract without written confirmation from the Engineer that:
- (i) in the case of borrow areas, the necessary negotiations with the owner of the property have been concluded and permission has been granted for the Contractor to enter upon the land and take material; and
  - (ii) in the case of temporary access and access roads to borrow areas, the Contractor has complied with the requirements stated below and elsewhere regarding the serving of notice and making of detailed arrangements with the owner for *inter alia* access, compensation and reinstatement.
  - (iii) in the case of statutory control, the necessary legal procedures have been followed and permission has been granted for the Contractor to enter upon the land and remove the necessary material.

- (b) The Contractor shall put in writing all agreements with owners of property outside the road reserve, in respect of the following matters:
- (i) the location, extent and use of borrow pits, haul roads, construction roads and bypasses outside the road reserve;
  - (ii) compensation for land or materials taken or for land temporarily used or occupied;
  - (iii) reinstatement of property occupied, used, damaged or destroyed or compensation for this in lieu of reinstatement; and
  - (iv) any similar matter directly concerned with the Contractor's activities on or in respect of private property or services.

These agreements shall be signed by all the parties concerned and be delivered to the Engineer.

Where the Contractor is not able to obtain the owner's agreement in writing, the Contractor shall refer the matter to the Engineer and furnish details in writing of any verbal agreement made.

- (c) Where, in addition to any agreement with the owner of any property to be entered upon or temporarily occupied, it is understood or required that the Contractor shall serve notice immediately before actually entering or occupying private property, proper notice shall be given in writing and the Engineer shall be supplied with a copy of such notice and acknowledgement of receipt thereof.
- (d) On completion of the Contractor's operations, the Contractor shall obtain from the owner concerned, a written statement:
- (i) that the owner is satisfied that the Contractor has fulfilled all obligations under any written agreement or, in the absence of a written agreement; and
  - (ii) that the owner is satisfied at having received all the entitled compensation and also is satisfied that all property occupied, including borrow pits, haul roads and construction roads, have been properly restored and are in satisfactory condition.



All such statements shall be signed, dated and delivered to the Engineer.

**M0211 EXTENSION OF TIME RESULTING FROM ABNORMAL RAINFALL**

There will be no extensions of time on this contract due to abnormal rainfall except as provided for below.

Should the Contractor, due to the occurrence of abnormal rainfall be unable to carry out the works, nor meet the rate of progress specified, then the Engineer shall determine the number of days lost due to the occurrence of rain on the critical path method.

A delay caused by inclement weather conditions will be regarded as a delay only if, in the opinion of the Engineer, all progress on an activity of work of which the activity's progress has been specified has been brought to a halt. Delays on working days only (based on a five-day working week) will be taken into account for the extension of time.

The extension of time will be deducted from the time the Contractor completed the works after the specified time.

Should the occurrence of rain delay the Contractor's rate of progress on work programmed at the end of the contract, the provisions in the above paragraph shall still apply. In this instance, the Employer shall have the right to discontinue the work in progress on the date that the contract expires, based upon sole discretion, or grant an extension of time in terms of Subclause 8.4 of the FIDIC Conditions of Contract for Construction, 1999 equal to the number of days lost due to rainfall in respect of the activities affected by the rainfall, as determined by the Engineer.

**M0212 INFORMATION FURNISHED BY THE EMPLOYER**

Certain information contained in these contract documents or provided separately is offered in good faith but in the circumstances pertaining to the type of information supplied, no guarantee can be given that all the information is necessarily correct or representative of the in situ conditions.

The Employer accepts no liability for the correctness or otherwise of the information supplied or for the resulting damages, where direct or consequential, should it prove during the course of the contract that the information supplied is either not correct or not representative. Any reliance that the Contractor places on this information shall be at the Contractor's own risk.

**M0213 PROTECTION OF THE WORKS**

The Contractor will be held responsible for all damage to the road and road furniture comprising road signs, road markers, bridges, SOS emergency telephones, guard-rails, fences, drainage systems, trees or shrubs and table or chairs in rest areas, being the result of any act on the Contractor's part or that of the labour force. It is the responsibility of the Contractor to point out to the Engineer any damage to existing road furniture prior to the commencement of work.

The Engineer will make the necessary arrangements to have the damage caused by the Contractor repaired and all costs incurred will be for the Contractor's account.

**M0214 REMEDIAL WORK**

When, upon examination by the Engineer, any part of the works or any equipment or material is found not to conform to the requirements of the specifications or is at any stage before final acceptance damaged so that it no longer conforms to the requirements of the specifications, the Engineer may order its complete removal and replacement, at the Contractor's expense, with satisfactory work, equipment or material or the Engineer may permit the Contractor to apply remedial measures in order to make good any such defects or damage. The actual remedial measures taken shall at all times be entirely at the Contractor's own initiative, risk and cost, but subject to the Engineer's approval regarding the details thereof.

In particular remedial measures must ensure that the final product is in full compliance with the

specifications, shall not endanger or damage any other part of the works and shall be carefully controlled and submitted to the Engineer for examination when completed or at any intermediate stage as may be required.

M0215 WATER

The Contractor himself shall make arrangements for procuring, transporting, storing, distributing and applying the water needed for construction and other purposes, except where otherwise specified. No direct payment will be made for providing water, the cost of which shall be included in the rates tendered for the various items of work for which water is needed

M0216 THE USE OF EXPLOSIVES

Generally the Contractor will be permitted to use explosives for breaking up rock and hard material during excavation, for demolishing existing structures, and for such other purposes for which it may normally be required subject to the following conditions:

- (a) The Engineer will have the right to prohibit the use of explosives in cases where, in the Engineer's opinion, the risk of injury to persons or damage to property or adjoining structures is too high. Such action by the Engineer shall not entitle the Contractor to any additional payment for having to resort to other less economical methods of construction unless otherwise provided for in the Project Specifications or the Schedule of Quantities.
- (b) The Contractor shall take proper care when excavating in cuts not to loosen, where it can be avoided, any material outside the specified cut line by blasting which would endanger the stability of the slopes. Remedial work shall be carried out as directed by the Engineer at the Contractor's own costs.
- (c) Legal provisions in regard to the use of explosives and the requirements of the Inspector of Explosives shall be strictly complied with.
- (d) The Contractor shall, at his own cost, make arrangements for supplying, transporting, storing and using explosives.

M0217 THE HANDING-OVER OF THE ROAD RESERVE

The road reserve will be handed over to the Contractor for maintenance, subject to such conditions as may be specified in the Project Specifications regarding matters such as the sequence in which sections will be handed over and must be completed, the maximum total length of bypasses that will be allowed to be in operation at any time, and any other matters relating to the Contractor's use and occupation of the road reserve.

The Employer may from time to time hand over certain sections of road within the maintenance contract road reserve to other Contractors for the rehabilitation of the road. The Contractor can be appointed as a nominated Subcontractor by the rehabilitation Contractor to do the routine road maintenance work as specified for that section of road.

M0218 DAILY RECORDS

The Contractor shall furnish the Engineer daily with records, on forms approved by the Engineer, of work executed by him for each maintenance activity. The records shall include information such as description, location, measurements, equipment and labour hours, where applicable and, all other information the Engineer may require for record and measurement purposes.

M0219 SITE MEETINGS

- (a) Progress meetings

The Contractor or an authorised representative shall attend progress meetings on site with representatives of the Employer and the Engineer at dates and times to be

determined by the Employer. Such meetings will be held for evaluating the progress of the maintenance contract and for discussing matters pertaining to the contract which any of the parties represented may wish to raise. Such meetings are not intended for discussing matters concerning the normal day-to-day running of the contract. The frequency of these meetings may vary depending on the needs of the contract.

(b) Weekly meetings

The Contractor or an authorised representative and the Engineer's representatives shall meet weekly to discuss progress in relation to the programme and matters concerning the normal day-to-day running of the contract.

M0220 PERMANENT MAINTENANCE TEAMS

The Engineer may require that certain permanent maintenance teams be established on site. These teams shall carry out work as identified or as instructed by the Engineer on a regular basis. The teams shall be monitored on a daily basis.

The emergency standby team/s shall be continuously available and at full strength for the duration of the maintenance contract.

The equipment and labour requirements for each team and the method of payment shall be specified in the Project Specifications.

M0221 LABOUR MAXIMISATION, STRUCTURED TRAINING AND ABE SUPPORT

The Employer requires the active participation of the Contractor with the Government's Reconstruction and Development Programme.

The performance of the Contractor in the abovementioned will be measured in order to monitor the extent to which the Contractor has reached the goals as set out in the Project Specifications. Failure to reach these goals will make the Contractor liable for a penalty as described in the Project Specifications.

M0222 REIMBURSEMENT OF TOLL CHARGES

The Contractor will not be compensated separately for the costs of toll charges arising from the passage of own and Subcontractors' vehicles and equipment through toll plazas for the purposes of executing the works. Any cost associated with toll charges must be included in section M0300: Contractor's Establishment on Site and General Obligations.

M0223 SABS CEMENT SPECIFICATIONS

Where reference is made in this specification or the Project Specifications to the Cement Specifications, e.g. SABS471: Portland cement and rapid hardening Portland cement, it shall be replaced with the following specification:

SABS ENV 197-1 "Cement composition, specifications and conformity criteria Part 1: common cements.

Furthermore, where reference is made in this specification or the Project Specifications to a

different cement type, the following names will apply and the Engineer will confirm the relevant new name from the table below:

Cement Grade	Cement Type	Approximate old product name	New Alpha	New Blue Circle	New NPC	New PPC	New Slag-cement
52,5	CEM I	Rapid hardening	Rapid hard	Duracast	Eagle Super	-	-
42,5 R	CEM I	Rapd hardening	-	-	-	Rapo	-
42,5	CEM I	OPC *	Portland Cement	Duratech	-	OPC	-
	CEM I	LASRC	-	-	-	LASRC	-
	CEM II A-S	PC 15SL	-	-	Eagle plus	-	-
	CEM II B-S	RH30SL	-	-	Eagle plus	-	-
32,5R	-	-	-	-	-	-	-
32,5	CEM II A-V	PC 15FA	All purpose cement	-	-	Surebuild	-
	CEM II A-W	PC 15FA	-	-	-	Surebuild	-
	CEM II A-L	-	All purpose cement	-	-	Surebuild	-
	CEM II B-V or W	PC25FA/PFA C**	-	Structrete	-	Surecrete	-
	CEM III A	PBFC	-	BFC	Eagle Pro	-	PBFC
	CEM IIIA	RHSL	-	-	-	-	RHSL
22,5	MC 22.5X	PFAC***	Multi purpose cement	Durabuild	-	-	-
	MC22.5X	PFAC***	-	Buildcrete	-	-	-
12,5	MC12,5	Walcrete	Mortar cement	Wallcrete	-	Masonry	-
	MC 12,5	Mortacem	-	-	-	-	-

Notes: \* OPC cements previous performed approximately as CEM I 32,5R products  
\*\* PC25FA cements under the old standards achieved lower compressive strengths than the OPC's of the time  
\*\*\* Some PFAC cements meet the new standard for MC 22,5X. Others required modification before meeting the requirements for MC 22,5X.

## M0224 MEASUREMENT AND PAYMENT

### M0200 GENERAL REQUIREMENTS AND PROVISIONS

<u>Item</u>	<u>Unit</u>
M020.01 Information sign boards	
(a) Type 1 (large)	number (No)
(b) Type 2 (small)	number (No)

The unit of measurement shall be the number of signs supplied in accordance with the specifications, drawings and the Engineer's instructions.

The tendered amount shall include full compensation for supply, transport, erection supports, material and maintaining the sign for the duration of the contract and final removal at the end of the contract.

<u>Item</u>		<u>Unit</u>
M020.02	Compensation to landowners	
(a)	Provisional sum for compensation to landowners(Prov	provisional sum Sum)
(b)	The Contractor's overhead charges and profit in respect of sub-item M020.02 (a) above	percentage (%)

Measurement and payment shall be in accordance with the provisions of Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage is a percentage of the amount actually spent under sub-item M020.02 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

<u>Item</u>		<u>Unit</u>
M020.03	Advertising cost	
(a)	Provisional sum for the cost of advertising	provisional sum (Prov Sum)
(b)	The Contractor's overhead charges and profit in respect of sub-item M020.03 (a) above	percentage (%)

Measurement and payment shall be in accordance with the provisions of Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage is a percentage of the amount actually spent under sub-item M020.03 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

<u>Item</u>		<u>Unit</u>
M020.04	Project Liaison Officer	
(a)	Provisional sum for the cost of PLO	provisional sum (Prov Sum)
(b)	The Contractor's overhead charges and profit in respect of sub-item M020.04 (a) above	percentage (%)

Measurement and payment shall be in accordance with the provisions of Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage is a percentage of the amount actually spent under sub-item M020.04(a), which shall include full compensation for the overhead charges and profit of the Contractor.

Payment shall be made monthly on approval by the Engineer.

**SERIES M0000 : GENERAL**

**SECTION M0300 : CONTRACTOR'S ESTABLISHMENT ON SITE AND GENERAL OBLIGATIONS**

**CONTENTS**

M0301 SCOPE  
M0302 GENERAL REQUIREMENTS  
M0303 MEASUREMENT AND PAYMENT

**M0301 SCOPE**

This section covers all work and costs involved in the establishment of the Contractor's organisation, Engineer's office, camps and equipment on site, and the removal thereof after completion of the maintenance contract. It also covers payment for certain general obligations, liabilities and risks and general items of cost not covered elsewhere.

**M0302 GENERAL REQUIREMENTS**

**(a) Camps, constructional equipment and testing facilities**

The Contractor shall establish construction camps, offices, stores, workshops and testing facilities on a site or sites approved beforehand by the Engineer or indicated at the site inspection. Accommodation, ablution and other facilities for the site staff shall also be provided as required and the standard of accommodation and the location of all facilities shall comply with the requirements of the authorities concerned.

The Contractor shall also move all necessary equipment and personnel to the site prior to starting work, and from the site after completion of the work, leaving the campsites clean and tidy and free from obstructions.

The Contractor shall enter into an agreement of occupation with the landowner or owners and copies of such agreements are to be provided to the Engineer on commencement of the contract. Copies of agreements of satisfactory condition of the sites at hand-over on taking-over of the work shall be provided to the Engineer.

**(b) Office for the Engineer**

The Contractor will provide the Engineer with office space of 15m<sup>2</sup> and a carport at the Contractor's campsite or offices. The office shall be constructed from timber, fibre-cement or other approved material. The office shall have double walls filled with insulating material and lined on the inside with timber or other approved material. Ceilings shall be provided for the office building. The office building shall have timber floors or concrete floors with vinyl floor tiles. Window areas of the office shall be at least equal to 25% of the floor area. The office shall be provided with approved burglar proofing.

The office building shall be painted with an approved paint after erection. The paint work shall be maintained during the contract period.

The door shall be equipped with a lock and two keys.

The siting and orientation of the office shall be to the Engineer's satisfaction and shall be decided on in consultation with the Engineer and confirmed in writing before erection. The office shall be provided with 220 volt electricity.

The clear height of all offices between floor and ceiling shall be 2,4m minimum. All windows shall be of the type that can open over the full window area.

The Contractor shall provide and install an air-conditioning unit for the office. The air-conditioning unit shall be of the electrically operated compressor type with closed circuit and not of the evaporation type. The capacity of the air-conditioning unit shall be at least 2,2kW.

The Contractor shall construct a carport for the Engineer to protect the Engineer's vehicle at all times against the direct rays of the sun. The carport shall be at least 20m<sup>2</sup> in area and the floor shall consist of a layer of broken stone to alleviate dusty and muddy conditions. The carport shall be at least 3m wide and shall have headroom of at least 2m. The roof of the carport shall be waterproof.

The Contractor shall be responsible for the provision and payment of electricity, water and sewerage.

The office and carport shall meet with the approval of the Engineer.

(c) Maintenance during Contract Period

During the Contract Period the Contractor and Subcontractors' camps, staff living quarters and other facilities shall be maintained in a neat and tidy condition.

(d) Legal relations and responsibility to the public

The Contractor shall take the necessary steps to comply with the terms of the FIDIC Conditions of Contract for Construction, 1999 particularly in respect of the insurance's and indemnities required, and the Contractor shall comply with all regulations of statutory authorities. The Contractor shall have adequate insurance to comply with his obligations. Details of such insurance must be provided prior to his signing of the Contract.

(e) Cellular phone

It is a requirement of the contract that the Contractor's site agent and senior site personnel be provided with cellular phones to allow for effective communication between the Contractor's personnel. All costs associated with the provision of the cellular phones will be viewed as being covered by this section.

M0303 MEASUREMENT AND PAYMENT

<u>Item</u>	<u>Unit</u>
M030.01 Fixed obligations	lump sum (LS)

Payment shall be a lump sum to provide for the Contractor's fixed expenses in connection with:

- setting up the Contractor's organisation, camps and equipment on the site, and the removal of the same on completion; and
- meeting all other general obligations and liabilities which are not specifically measured for payment under any other items of payment.

The lump sum tendered shall represent full compensation for the fixed part of the Contractor's general obligations, ie that part which is substantially fixed and is not a function of time required for the completion of the contract or of the value of the work.

The tendered lump sum shall not be subject to any variation of the actual value if work done under the contract exceeds or falls short of the tendered amount or as a result of any extension of time for completion in terms of FIDIC Conditions of Contract for Construction, 1999. The tendered lump sum shall not include any fixed obligation costs for the subcontracts involving ABEs and SMEs.

Before any payment is made under this item, the Contractor shall satisfy the Engineer that the Contractor has provided on site, camps and equipment of good quality and in value exceeding that of the first instalment.

The Contractor may also be required to furnish documented proof that the camps and equipment on site is owned by the Contractor and that the value of such items exceeds the amount claimed under the first payment.

In the event of the Contractor not being able to satisfy the Engineer as to the value of ownership of the camps and equipment, the Engineer shall have the right to withhold part of any payments to be made under this item until the works have been completed.

Payment of the lump sum shall be made in three instalments as follows:

- (a) The first instalment, 50% of the lump sum will be paid in the first payment certificate after the Contractor has met all the obligations under this section and has made a substantial start with construction in accordance with the approved programme.
- (b) The second instalment, 35% of the lump sum will be paid when the value of the work completed reaches half of the tendered amount, excluding contingencies and price adjustments.
- (c) The third and final payment, 15% of the lump sum, will be paid when the works have been completed for the contract and the Contractor has fulfilled all the requirements of this section. If the contract is extended as specified, this payment will only be paid on completion of the extended period.

<u>Item</u>	<u>Unit</u>
M030.02 Fixed obligation if contract is extended as specified	lump sum (LS)

Payment shall be a lump sum to provide for the Contractor's fixed expenses in connection with:

- The Contractor's organisation, camps and equipment on site;
- Meeting all other general obligations and liabilities which are not specifically measured for payment.

The payment item is only applicable if the contract is extended and will be paid at the beginning of the extension.

<u>Item</u>	<u>Unit</u>
M030.03 Time-related obligations	month

The tendered rate per month represents full compensation for that part of the Contractor's general obligations, i.e. the insurance and indemnities required in terms of the FIDIC Conditions of Contract for Construction, 1999 and all other requirements, which are mainly a function of time. The tendered sum will be paid monthly, pro rata for parts of a month, until the end of the period for completion of the works plus any extension thereof.



**SERIES M0000 : GENERAL**

**SECTION M0400 : ROUTE PATROL SERVICES**

## CONTENTS

M0401 SCOPE  
M0402 GENERAL REQUIREMENTS  
M0403 MEASUREMENT AND PAYMENT

M0401 SCOPE

This section covers the provision of a route patrol service along the entire site

M0402 GENERAL REQUIREMENTS

The Contractor shall provide a route patrol service along the entire site as specified. On dual carriageway roads, each carriageway shall be travelled once a day along its full extent, and shall include the ramps and crossroads. On single carriageway roads, the route need only be travelled along in one direction once a day to fulfill route patrol duties on both sides of the road. During inspection of the road the route patrol service shall notify the Engineer, and the relevant road traffic authority, police, emergency service or other appropriate agency of the particular activity, incident and accident. The Contractor shall follow up on incidents with the relevant agency and keep a record of all incidents as specified by the Incident Management System (IMS).

The leader of each route patrol service must have previous road supervision experience and must submit his/her Curriculum Vitae for approval prior to being used in this capacity.

(a) The duties of the route patrol service will be as follows:

(i) Road pavement, drainage, fencing and road furniture

The route patrol service shall inspect the route reporting any damage to the road network or theft of road furniture including *inter alia* potholes, damaged guard-rails, damaged structures, damaged road signs, blocked drains, ponding of water, weather damage and veld fires and theft of fencing, road signs, grids and bridge handrails. The inspection shall include incidents occurring outside the road reserve, which may have an influence on the safety and integrity of the road network.

The route patrol service shall perform temporary and minor fence repairs where livestock can enter the road reserve and sign repairs where necessary.

(ii) Debris

The route patrol service shall remove all foreign articles from the carriageway, which shall include *inter alia* any debris, spilt loads, concentrated piles of refuse, animal carcasses, branches, trees, dangerous objects, stripped tyre treads and accident debris.

All foreign articles shall be loaded and carted away by the route patrol service. All large objects that cannot be picked up by the team and excessive accident debris or large spilt loads shall be removed under dayworks or the applicable payment items.

(iii) Signs and illegal signs

The route patrol service shall perform temporary and minor sign repairs where necessary.

The route patrol service shall remove all illegal signs within the road reserve such as banners, posters, signs less than 0,5m<sup>2</sup> and all graffiti on structures.

(iv) Accidents and traffic incidents

Any accidents or traffic incidents shall be reported to the relevant authority according to the Incident Management System protocols. It shall include reporting incidents of illegal pedestrians, illegal road blocks, abandoned vehicles, unauthorised vehicles, vehicles spilling their load or fuel, overloaded vehicles and vehicles which are a potential danger to other motorists.

(v) Assistance to motorists

Provide assistance to stranded motorists requiring water, fuel, tyre change, jump-start with booster cables and minor repairs. It shall include assistance to stranded motorists by notifying relevant agencies when major repairs are required, pushing disabled vehicles off the roadway, and providing emergency transportation. Assistance and travel information shall be provided to lost motorists.

(vi) Veld Fires

The route patrol service shall report with details all veld fires to the Engineer. The route patrol service shall perform the fire fighting duties until the emergency standby team or emergency services arrive.

(vii) Statutory Control

The route patrol service shall inspect the route and report any infringements (within the road reserve and including the building restricted area) to the Engineer without delay and if so required by the Employer, shall act on his behalf when instructed. Some examples are:

- Illegal advertisement
- Illegal trading
- Illegal accesses
- Illegal occupation of the road reserve
- Building line transgressions

(b) Route patrol vehicle, equipment and personnel

The minimum requirements in respect of vehicles and equipment to be supplied by the Contractor are:

(i) Patrol vehicle

The route patrol vehicle shall be a LDV ( $\pm 1$  ton) driven by a competent driver capable of providing a high standard of service according to the requirements. The vehicle shall contain a cellular telephone, road maps, 9kg fire extinguisher, and be fitted with a hazard light with a minimum intensity of 100W. The word PATROL SERVICE, 250mm in height, shall be written in letters clearly legible during both daylight and night on both sides of the LDV.

(ii) Route patrol equipment

The route patrol vehicle will carry the following minimum equipment items:

- i. Fire extinguisher
  - ii. 10 x day-glow orange cones
  - iii. Shovel / broom
  - iv. Set of tools and battery jumper leads
  - v. Cans for fuel, oil and water
  - vi. Spotlight (removable) and flashlight
  - vii. Basic emergency spares such as fan belts and tyre repairs kits
  - viii. Warning signs (as specified)
  - ix. Basic fence and sign repair materials for minor repairs
  - x. Safety jackets (as specified)
  - xi. Plastic bags for rubble
- (iii) Route patrol personnel

The personnel used to man the route patrol vehicle shall be well equipped and trained to undertake all the route patrol service duties as specified.

The patrol team will consist of the leader plus one (1) labourer for assistance.

(c) Reporting of daily records

The route patrol service shall use Global Positioning Systems (GPS) to record his activities and positions. The route patrol service will record its position every half hour on the GPS as well as every activity or incident. This information will be submitted electronically daily to the Engineer.

The Contractor shall submit to the Engineer daily records of any damage to the road network and work executed by the route patrol services. The records shall include information such as the description of damage, location, measurements where applicable and all other information the Engineer may require for record purposes as well as timesheets of all activities and work executed by the route patrol services.

If the Contractor fails to comply with the specifications and duties set out for the route patrol services or fails to supply the service for a period of time, the Contractor will be penalised as specified in the Project Specifications.

M0403 MEASUREMENT AND PAYMENT

<u>Item</u>	<u>Unit</u>
M040.01 Route patrol service per team (including LDV and equipment)	month

The rate tendered per month shall include, per team, full compensation for providing the service specified for weekdays, weekends and public holidays from 06:00 in the morning to 22:00 in the evening or as specified including the labour, equipment required and costs associated with the disposal of the foreign articles as specified in this section. The tendered rate shall also provide for all reporting, notifications and follow up of relevant incidents, and keeping of records thereof.

**SERIES M0000 : GENERAL**

**SECTION M0500 : ACCOMMODATION OF TRAFFIC**

## CONTENTS

M0501 SCOPE  
M0502 GENERAL REQUIREMENTS  
M0503 MEASUREMENT AND PAYMENT

### M0501 SCOPE

This section covers the provision, erection and maintenance of the necessary temporary signs and barricades, and everything necessary for the safe and easy passage of all public traffic during maintenance operations on single and dual carriageway roads.

### M0502 GENERAL REQUIREMENTS

- (a) Any cost associated with the accommodation of traffic must be included in payment items M050.01, M050.02 and M050.03.

The Contractor shall submit to the Engineer a list of temporary road signs with the Contractor's programme for approval. The list will contain the necessary temporary road signs the Contractor will require to achieve the rate of progress set out in the Contractor's programme. The submission of such a list to the Engineer and the approval thereof, shall not release the Contractor of any responsibilities and time restraints under the contract.

- (b) Traffic Safety Officer

(i) General Duties

The Contractor shall submit a Curriculum Vitae (CV) of the proposed Traffic Safety Officer to the Engineer for approval whose responsibility shall be the correct placing of all temporary traffic control facilities and road signs, for the maintenance, repair, replacement and removal thereof and report on all incidents, accidents and hazardous spillages.

No additional payment will be made for the Traffic Safety Officer and any costs and profits regarding the Officer and equipment shall be deemed to be included in payment item M050.03.

(ii) Equipment

The Contractor shall provide the Traffic Safety Officer with the necessary resources, *inter alia*, a suitable vehicle being a light delivery van, warning signs and revolving/strobe amber flashing lights with a minimum intensity of 100W. The words TRAFFIC CONTROL, 250mm high, shall be written on a warning sign in letters clearly legible day and night and the sign shall be mounted on the vehicle to be clearly visible.

The vehicle shall be equipped with a cellular phone and be on the Contractor's site radio net. The Traffic Safety Officer, the Officer's vehicle, equipment and personnel shall be available 24 hours per day and on special non-working days/hours as specified and shall not be utilised for other duties except emergency call-outs. The Officer shall liaise directly with the Engineer regarding matters relating to the control of traffic.

(iii) Accidents

The Traffic Safety Officer shall also be responsible for contacting the traffic authorities and South African Police Services in the event of an accident on the section of road under maintenance and provide reasonable assistance in the event of a dangerous or life threatening situation. The Officer will be required to carry first aid equipment at all times in the vehicle.

The officer shall obtain all available information on incidents and accidents at the site and submit these to the Engineer for the Employer's Incident Management System. The Contractor shall participate in the Incident Management System for the route. The Traffic Safety Officer shall monitor and carry out an audit of all activities at a major accident scene. This includes a detailed activity report on the resources, equipment and material used by the various responding parties at the accident scene. This information will be used by the Engineer who will be responsible for verifying all claims received from involved parties prior to being passed onto the Employer.

The Traffic Safety Officer shall record on neat and dimensioned sketches and submit to the Engineer the position and sign reference number where applicable of each sign, barricade, delineator, cone, amber, flicker light, guard-rail and permanent or temporary painted road marking feature. The position of each shall be adequately referenced to identifiable permanent features located along the site of the works.

These records shall also show the date and time at which the recorded traffic accommodation features are certified correct by the Traffic Safety Officer, and shall be signed by the Traffic Safety Officer before being submitted to the Engineer.

The records shall be amended whenever changes are made in the field and the revised detailed sketches shall be submitted to the Engineer. This shall include the recording of the position of flagmen and STOP/GO control men and their associated traffic accommodation equipment wherever they are used.

The Traffic Safety Officer shall personally inspect the position and condition of each traffic accommodation feature everyday to record all irregularities discovered and the remedial action taken, and to sign off as correct and submit to the Engineer such record sheets by 17:00 each day. The Traffic Safety Officer shall keep a duplicate book for this specific purpose.

- (c) The Contractor shall provide, erect, maintain and remove the necessary traffic-control facilities, road signs, channelization devices, barricades and warning devices (hereinafter referred to as traffic control facilities) as shown on the drawings and in Chapter 13 of Volume 2 of the South African Road Signs Manual. The Contractor shall ensure that the abovementioned traffic control devices are present where required at all times and are functioning properly.

The failure to provide all the signs or refusal by the Contractor to take the necessary precautions for the safety and convenience of public traffic as required by this document, Statutory Authorities or as ordered by the Engineer, shall be sufficient cause for closing down all work until all provisions prescribed have been complied with to the satisfaction of the Engineer.

- (d) Traffic control devices no longer required at the site of a deviation or a lane closure shall be moved for re-use. Traffic control devices lost or damaged by the Contractor or public shall be replaced at the Contractor's cost.
- (e) The type of construction, spacing and placement of traffic control devices shall be in accordance with Chapter 13 of Volume 2 of the South African Road Signs Traffic Manual or as shown on the drawings.

- (f) The Contractor shall arrange the work so that the traffic shall at all times have unimpeded one way access to at least half the width of the road on single carriageway roads, and one or two lanes on dual carriageway roads during the execution of maintenance work. Whenever possible, the Contractor shall ensure that the whole road width or carriageway shall be open at night and all signs no longer applicable to the situation removed or effectively covered. If the road or carriageway is not in a safe trafficable condition over the whole width at the end of each day's work, the Contractor shall supply adequate flagmen, signs, barriers, lights and necessary staff to ensure a reasonable free flow of traffic alternately in each direction on single carriageway roads and on one or two lanes on dual carriageway roads throughout the whole period that the roadway is opened to traffic.
- (g) Work on a carriageway shall be restricted to one side of the carriageway only at any particular point and no work may be carried out simultaneously on the slow shoulder and fast lane.

Partial closure of a lane will not be permitted.

Traffic will not be permitted to deviate around both sides of a working area, which is situated in the middle of a carriageway. Only in exceptional circumstances such as a working area being in close proximity to an on-ramp, will traffic be permitted to travel on both sides of the working area, whereby traffic from the on-ramp shall be separated from through traffic until the vehicles have travelled a safe distance beyond the working area. Such traffic deviations shall be carried out only under the specific authorisation of the Engineer.

Temporary lane closures shall be subject to the approval of the Engineer and may not be permitted on days and time periods when high traffic volumes are anticipated. The Engineer will notify the Contractor in writing, in advance of such restrictions.

Temporary lane closures will only be permitted in daylight hours, unless otherwise directed by the Engineer.

The Contractor's attention is drawn to the restricted hours of work on normal maintenance activities on certain sections of the site, as detailed in the Project Specifications. Work may also be stopped if there is excessive traffic flow or traffic congestion, at the discretion of the Engineer.

- (h) The various traffic control facilities, which may be required, are as follows:

- (i) Traffic control devices

Traffic control devices involving the use of flagmen, portable STOP and STOP/GO signs, and traffic control signals, whichever may be the most suitable method under prevailing circumstances. Traffic control signals shall be erected only if so specified in the Project Specification or upon an instruction in writing, by the Engineer.

- (ii) Road signs and barricades

Road signs shall include all signs in the R, W and G series, which shall also include danger plates and removable barricades.

Road signs shall be made of steel sheets 1,60mm thick, but may also be made from chromadek; all background letters and symbols shall be of engineering-grade retro reflective material.

The basic minimum clearance for the R, W and G Series shall be 800mm from the road surface.

- (iii) Channelization devices and barricades.

Channelization devices shall include cones and delineators. Barricades include barrier lattices, movable barricades or other types as shown on the drawings. All delineators shall be manufactured from plastic.

The use of steel drums as channelization devices will not be permitted.

Temporary warning signs, delineators and barricades shall be of the black, yellow and red type, in accordance with the figures and plans included in the Contract documents, but regulatory signs shall be in accordance with Chapter 13 of Volume 2 of the South African Road Traffic Signs Manual.

(iv) Flagmen

The Contractor shall provide well-trained and at least two equipped flagmen for each work area during the daytime as specified per drawing. Each flagman must have a red flag with the minimum size of 600mm x 600mm and a highly visible vest over his overall.

A flagman must be positioned to give sufficient warning in advance when loading, unloading or access of plant and equipment disrupts the flow of traffic.

No separate payment will be made for flagmen and any costs associated with it, including the provision thereof, must be included in item M050.03.

- (i) All vehicles and items of mobile equipment operating on site shall be supplied with electrically operated amber rotating/strobe warning lights of robust construction. The amber lens shall have a height of at least 150mm and an output of at least 100W. The beacons shall be so placed as to be clearly visible from all directions from a distance of three hundred (300) metres.

In addition, all powered vehicles used on the contract shall be fitted with warning sign boards mounted across the back and front of the vehicle. These boards shall be the same width as the vehicle, 400mm high and display the word "MAINTENANCE" in bold black letters on a yellow background and be subject to the approval of the Engineer.

- (j) The Contractor shall provide at the Contractor's expense, reflective waistcoats and orange/yellow overalls or others, which have been approved by the Engineer for each worker on site.

- (k) The following standards shall be applied when selecting and positioning road signs.

- (i) Only standard signs shall be used.
- (ii) The signs shall be clean and in good condition.
- (iii) The start of lane closures shall be positioned such that a minimum sight distance of 300m, measured at a height of 1,05m from the road surface, is obtained.
- (iv) Sign stands shall be ballasted by sand bags filled with sand or soil that has a gradation such that 100% of the material passes the 6,7mm sieve and be of sufficient number and mass to prevent the signs being blown over by wind or air disturbance caused by passing vehicles. The sign stands and foot pieces shall be sufficiently robust and be large enough to enable the signs to be sufficiently ballasted.
- (v) The signs shall be displayed according to the standard specified.
- (vi) The sign layout must give the travelling public time to understand and respond to the information, which the signs convey.

- (vii) Always place signs furthestmost away from the work area and then work inwards in the direction of traffic.
- (viii) On completion of the work remove cones/signs by starting at the work area and work outwards against the flow of traffic.
- (l) The Contractor shall indemnify the Employer against all proceedings, claims, actions, damages and costs which may arise from or be related to the absence or improper functioning or replacement of traffic control facilities.
- (m) The type of construction, spacing and placement of all traffic control devices shall also be co-ordinated with the relevant traffic authority.
- (n) The following limitations to construction lengths and occupations of the road sections shall apply:
  - (i) The maximum length of the work area within a half-width or shoulder closure shall be 2km.
  - (ii) The minimum gap between closures shall be 3km.
  - (iii) Closures shall not be allowed opposite each other.
  - (iv) On non-working days and between sunset and sunrise all temporary road signs and traffic control facilities shall be removed from the carriageway with all traffic lanes fully open to traffic.
- (o) Penalties
 

Penalties shall be applied when the accommodation of traffic is not done according to the specified standards, and if maintenance of temporary road signs is not done timeously. Where the accommodation of traffic per work area is non-compliant the penalty as specified in the Project Specification is applicable. The Contractor will not be allowed to continue with any work until the accommodation of traffic complies with the specifications.

Verbal instructions in this regard shall be binding, and such instructions must, with complete detail on times, number of signs, positions and delays, be confirmed in writing in the official site diary. Penalties shall be recorded in the minutes of the site meetings.

## MEASUREMENT AND PAYMENT

<u>Item</u>	<u>Unit</u>
M050.01 Provision of temporary traffic control facilities	lump sum (LS)
<p>The tendered lump sum shall be in full compensation for the provision of all the temporary road signs needed to do the maintenance work and shall also include for the provision of sufficient surplus barricades, signs, delineators and cones on the site for replacement of damaged or missing items. Payment of the lump sum will be made in three instalments as follows:</p> <ul style="list-style-type: none"> <li>(i) The first instalment, 60% of the lump sum will be paid after the Contractor meets all the obligations regarding the provision of the temporary road signs.</li> </ul> <p>This payment will be subject to the approval of the list of temporary signs submitted by the Contractor with the Contractor's programme.</p>	



- (ii) The second instalment, 25% of the lump sum, will be paid when 35% of the contract period has expired. This payment will be subject to the approval of the existing and replaced signs.
- (iii) The third and final payment, 15% of the lump sum, will be paid when 70% of the contract period has expired. This payment will be subject to the approval of the existing and replaced signs.

<u>Item</u>		<u>Unit</u>
M050.02	Provision of temporary traffic control facilities if contract is extended as specified	lump sum (LS)

The tendered lump sum shall be in full compensation of the provision of all the necessary temporary road signs needed to continue the maintenance work for the extension of contract. Payment of the lump sum will only be made if the contract is extended and at the beginning of the extension.

<u>Item</u>		<u>Unit</u>
M050.03	Accommodation of traffic and maintaining temporary deviations	month

The tendered rate shall include full compensation for all costs associated with the accommodation of traffic and maintaining temporary deviations and shall include work constructed and paid under Section M9100. The tendered rate shall also include full compensation for the provision of a full-time Traffic Safety Officer and for all the duties performed by the Traffic Safety Officer. The tendered rate shall also include full compensation for the provision of communication equipment required for regulating the traffic, arranging for the moving of services, solving traffic problems, complying with the legal requirements of all authorities concerned, for providing temporary access to private property, and for the provision and maintenance of temporary drainage. The tendered rate shall also include any cost associated with the provision of flagmen.

**SERIES M0000 : GENERAL**

**SECTION M0600 : OVERHAUL**

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M0601	SCOPE
M0602	DEFINITIONS
M0603	MEASUREMENT AND PAYMENT

### M0601 SCOPE

This section covers the hauling of overhaul material as defined herein from the place of excavation or stockpile to the position of placement where such haul is in excess of the free-haul distance as defined herein.

Payment for hauling of overhaul material in excess of the free-haul distance will only be applicable for the following sections, M1100, M1700, M2100, M2200, M2600, M2800 and M3300. For the other sections any costs associated with hauling in excess of the free-haul distance must be included in the rates.

### M0602 DEFINITIONS

#### (a) Overhaul material

Overhaul materials shall be transported material to which overhaul shall apply when hauled in excess of the free-haul distance specified.

For the transporting of certain material to the position of placement a free-haul distance shall not apply.

Only the material specified in the various sections to be transported shall be paid for.

#### (b) Haul distance

The haul distance for cut or borrow to fill or spoil shall be the distance between the centre of volume of the overhaul material in the cut or the centre of volume where the material is spoiled before excavation and the centre of the volume of the fill constructed with the overhaul material.

In certain cases where volumes of material are measured in hauling vehicles as specified the haul distance shall be the distance from the point where the vehicle is fully loaded to its rated capacity to the place where it is finally deposited.

The haul distance shall be measured along the shortest route determined by the Engineer as being feasible and practicable. Should the Contractor choose to haul material over some other longer route, compensation shall nevertheless be based on the haul distance measured along the shortest route designated by the Engineer.

The haul distance shall be measured to the nearest 0,1km.

#### (c) Free-haul distance

The free-haul distance shall be the distance up to which overhaul material may be hauled before overhaul becomes payable. Unless otherwise specified this distance shall be 1,0km.

(d) Overhaul distance

The overhaul distance shall be the haul distance as defined above, less 1,0km measured to the nearest 0,1km.

M0603 MEASUREMENT AND PAYMENT

The quantity of material hauled shall in all cases be measured in the same manner as the item to which the haul applies.

Payment for the hauling of material shall be made in each section under the relevant items where the hauling operation is specified.

**SERIES M1000 : PAVEMENT MAINTENANCE**

**SECTION M1100 : PAVEMENT LAYERS REPAIR**

**CONTENTS**

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**M1101 SCOPE**

This section covers the work in connection with the repair of localised pavement failures other than potholes, edge breaks and surface failures in Section M1200.

Nominated Subcontractors with relevant experience shall undertake the repair work.

It involves the excavation of the deformed areas and reconstructing the pavement and surfacing layers, including treatment of the floor of the excavation prior to backfilling.

Pavement failures consist of a combination of rutting, cracking and displacement of the road surface and base layer or the surfacing layer only usually accompanied by disintegration of the surfacing.

**M1102 EXECUTION OF WORK**

**(a) Removal of distressed areas**

The Engineer will demarcate any failed areas to be repaired, and shall instruct the Contractor with regard to the repair work to be done. The Contractor shall provide assistance and temporary traffic control facilities for marking out failed sections of the road.

Unless otherwise instructed by the Engineer, the repaired area shall have a neat rectangular shape, at right angles to the direction of traffic. The existing material shall be excavated and removed to the specified depth.

Excavation for pavement failures shall be cut or trimmed with sideslopes perpendicular to the horizontal; for each excavated layer, a step shall be created with the horizontal distance equal to the vertical distance to a maximum of 150mm.

Where required, excavation shall be done with approved milling equipment. The equipment shall be so equipped that it will be able to mill out asphalt and/or cemented material to the prescribed depth in one operation over the width specified in the Project Specifications. The milling depth shall be controlled electronically.

The direction and speed of the milling machine and the speed of rotation of the milling drum shall be adjustable so as to obtain the required grading of the milled material. The machine shall be capable of making a neat vertical cut at the outer edges when milling the layer and to leave the floor of the cut level and with a uniform texture.

The milling machine shall be equipped with a self-loading conveyor belt, which can be easily removed and installed and adjusted for slope and direction.

Where all or a part of the existing surfacing material is to be reprocessed together with the underlying layer, the surfacing shall be properly broken down and mixed up to the full depth of the existing base material to the satisfaction of the Engineer. Fragments of bituminous material shall be broken down to sizes not exceeding 37,5mm.

Where specified in the Project Specifications or ordered by the Engineer, the existing bituminous material shall first be removed before the underlying layers are broken up.

Bituminous material may be milled out or otherwise broken up and removed to approved stockpile sites for recycling or to spoil sites, whichever is required. Where the underlying material is to be reprocessed as base, the exposed surface shall be cleaned to the satisfaction of the Engineer after removal of the bituminous material. All remaining fragments of bituminous material shall be removed, and not more than 5% of the surface may be covered with bituminous material.

The existing pavement material shall be broken down to the specified depth and removed, or reprocessed *insitu*, whichever may be required. The underlying layers may not be damaged, and material from one layer may not be mixed with that of another layer. Where such mixing occurs or where the material is contaminated in any other way by the actions of the Contractor, he shall remove such material and replace it with other approved material, all at his own cost.

Where so ordered by the Engineer, asphalt and cemented layers shall be cut or sawn through to the specified depth along the measured limit with approved equipment. No additional payment will be made for sawing.

The equipment to be used for the conventional breaking-up and excavation of existing pavement layers will be determined by the size and depth of the pavement section to be processed or excavated, taking into consideration the fact that work may have to be carried out in small areas.

Excavated material from each pavement layer shall be placed in separate stockpiles adjacent to the repaired area. The stockpiled material shall be re-used or spoiled at an approved site in accordance with the Engineer's instructions.

After completion of the excavation to the specified depth, the Engineer shall be afforded the opportunity to examine it. Where required, the floor of the excavation shall be compacted to the specified density for the layer concerned.

Excavated material shall be disposed of at approved sites unless re-use of material is ordered by the Engineer. At no time shall excess material be dumped in side drains or side banks.

(b) Backfilling of excavation for pavement failures

Prior to backfilling, the base and sides of the excavation shall be cleaned of all loose material. The excavation shall be backfilled with approved gravel, crushed stone or asphalt and compacted to a density as specified below:

Base	(0 – 150mm below final base level)	98%
Subbase	(150mm – 300mm below final base level)	95%
Selected	(300mm – 600mm below final base level)	93%
Fill	(Below 600mm of final base level)	90%

Backfilling of the excavation shall be done as follows:

- (i) The Engineer may instruct the Contractor to use stabilised material excavated from the existing pavement, as backfilling, either for subbase layers only or for both subbase and base layers. Material shall be broken down and 60kg/m<sup>3</sup> of CEM I cement (OPC) shall be added. Water shall be uniformly mixed into the material. The material shall then be returned to the road and compacted as specified above.

- (ii) Where required by the Engineer, backfilling for the base layer shall be done with imported crushed stone material of G3 or better quality, treated with bitumen emulsion. CEM I cement (OPC) or CEM III A cement (PBFC) shall be added at a rate of 1% (mass/mass) and mixed off the road by means of a concrete mixer or hand labour if approved by the Engineer. All mixing shall result in a homogenous mixture of additives and parent material, which is to the satisfaction of the Engineer.

Thereafter, the material shall be treated with a stable-grade bitumen emulsion at a rate of 3% (mass/mass). Before the emulsion is added to the stone, it shall be diluted with water so that the moisture content of the mix will be the optimum moisture content for compaction.

The mixed material shall then be transported to the excavated area, placed and compacted, all within 5 hours of the commencement of the mixing process. Thereafter, 0.6litres/m<sup>2</sup> of the diluted 60% bitumen emulsion shall be applied to the base or layer to ensure a sealed surface.

The density of the backfilling of the base layer shall be at least 98% of modified AASHTO density.

- (iii) Where required by the Engineer the backfilling of the base layer shall be done with continuously graded asphalt.

The rates of application and mix proportions of bituminous binder, aggregates and fillers which are given in Table M1105/2 are nominal rates and proportions and shall only be used for tendering purposes. The rates and proportions actually used shall be determined to suit the materials used and conditions prevailing during construction and any approved variation on a nominal mix in the bitumen content or active filler content shall be the subject of an adjustment in payment for binder or active filler variations.

Before production or delivery of the asphalt the Contractor shall submit samples of the materials the Contractor proposes to use in the mix, together with the Contractor's proposed mix design as determined by an approved laboratory so that the Engineer may test the materials and confirm the use of the proposed mix and satisfy himself that it meets the specified requirements. The Engineer also reserves the right to change aggregate blends in order to allow the selection of any combined aggregate grading within the specified grading envelope(s) for the proposed mix.

As soon as the materials become available the Contractor shall produce a working mix in the plant in accordance with the design mix. The working mix shall again be tested by the Contractor for compliance with the design requirements. Samples of the working mix and the test results shall also be made available to the Engineer, who will authorise the use of the working mix proportions approved for use. The composition of the approved working mix shall be maintained.

The nominal mix proportions (by mass) of the various asphalt mixes are set out in Table M1105/2.

The design of the asphalt mixes shall be in accordance with the design guidelines of TRH8 and appropriate research results and the mix properties and requirements shall be specified in the Project Specifications. In addition

to the design guidelines of TRH8, the asphalt mixes shall also comply with the requirements in Table M1105/1 unless otherwise stated in the Project Specifications

Compaction : The excavated areas shall be tacked at a spray rate of 0,40 litre per m<sup>2</sup> using 60% cationic emulsion.

The mix shall be rolled as soon as possible after it has been laid by a vibratory roller. Such rolling shall commence and be continued only for as long as it is effective and does not have any detrimental effect. Only steel wheel rollers (non-vibratory) will be permitted for the compaction.

As many rollers shall be used as is necessary to provide the specified pavement density and the required surface texture. During rolling of asphalt surfacing, the roller wheels shall be kept moist with only sufficient water to avoid picking up the material.

After longitudinal joints and edges have been compacted, rolling shall start longitudinally at the sides and gradually progress towards the centre of the pavement, except on super elevated curves, or where the areas to be paved has a cross-fall, when rolling shall begin on the low side and progress to the higher side, uniformly lapping each preceding track, covering the entire surface. During breakdown rolling the rollers shall move at a slow but uniform speed (not to exceed 5km/h) with the drive roller nearest the paver, unless otherwise specified on account of steep gradients.

The Contractor shall take adequate precautions to eliminate pick-up.

The sequence of rollers used in compaction is at the discretion of the Contractor provided the completed pavement shall have a density as measured on recovered core equal to or greater than 97%, minus the percentage voids in the approved production mix, of the theoretical maximum density, determined as described in TMH1 method C4.

The Contractor shall utilise a calibrated nuclear gauge for process control during compaction operations. Notwithstanding this requirement, the acceptance control carried out for compaction by the Engineer shall still be based on cores taken from the compacted layer.

- (a) Cracks or hair line cracks shall not be formed and the bond with the underlying layer shall not be broken.
- (b) The density shall be uniform over the whole area of the layer and extend over the full depth of the layer.
- (c) In restricted areas where the specified rollers cannot be used, compaction shall be carried out with hand-operated mechanical compaction equipment or approved smaller vibratory rollers. The prescribed density requirements remain applicable throughout over the full layer thickness irrespective of the method of compaction.
- (iv) The Contractor shall seal the joints between the new and old asphalt of the patch as specified in Section M1300 Payment for Sealing of the Joints will be under Section M1300.
- (v) All the backfilling shall be completed in geometric patterns of squares or rectangles and in each case the base layer shall be finished off neatly to 40mm  $\pm$  10mm below the levels of the surrounding sound road surface.

(c) Production limitations

As far as it is practically possible the size of the area to be repaired shall be limited to that which can be excavated, backfilled and opened to traffic within a single working day. Where this is impractical the Contractor shall consult with the Engineer regarding the signs requirement for controlling the traffic during night time. No area that is to be prepared shall be left exposed if rain is imminent.

The asphalt base material shall be placed in layers not exceeding 75mm and crushed stone material be placed in layers not exceeding 150mm measured in the loose. The surfacing material shall be placed in one layer at a thickness of 40mm  $\pm$  10mm level to or up to 5mm above the existing road surface level.

(d) Testing

Modified AASHTO densities shall be determined using TMHI Method A16T (preparation of stabilised material) and Method A7 (preparation of unstabilised material and compaction of materials).

M1103 ACCEPTANCE CRITERIA

The repaired area shall be rectangular in shape.

The edges of the completed surfacing shall not be above the existing surface by more than 3mm. The edges or any part of the patch area shall not be below the surrounding road surface.

The thickness of the asphalt surfacing at any point shall be 40mm  $\pm$  10mm.

The crossfall of the completed area shall be equal to that of the adjacent surface to within a tolerance of  $\pm$  0,5% crossfall.

When tested with a 3m straight edge laid parallel to or at right angles to the road centreline the surface of the area shall not deviate from the bottom of the straight edge by more than 5mm.

The reconstruction of the pavement layers shall require a standard of workmanship to produce a repaired area that will not deteriorate as specified in the Project Specifications.

M1104 EQUIPMENT

All equipment shall be suitable for the specified use and size of working areas and shall be capable of obtaining the specified results.

Only approved cutting or sawing equipment may be used for cutting or sawing asphalt layers. The equipment shall be capable of cutting asphalt layers to depths of 200mm in one operation without fragmenting the material, and in straight lines within the required tolerances.

The following items of plant and equipment shall also be available and in good working order:

A vibratory roller having a mass approximately equal to that of a Bomag 90 or similar vibratory roller, with an adjustable amplitude and frequency of vibration.

A mobile compressor capable of producing at least 3 m<sup>3</sup>/minute compressed air at 750kPa.

Appropriate paving breakers.

Approved milling machine if required.

Manually operated pneumatic compactors as required.

Appropriate concrete mixers.



M1105 MATERIALS

(a) Crushed Stone

Crushed stone for use as backfill shall be of G3 or better quality, from an approved commercial source, and shall comply with SABS 1083 in general and Table M1105/1 and Table M1105/2:

<b>TABLE M1105/1: 10% FINES AGGREGATE CRUSHING VALUES</b>				
<b>ROCK TYPE</b>	<b>MATRIX</b>	<b>DRY MIN</b>	<b>WET MIN</b>	<b>WET/DRY RELATIONSHIP MIN</b>
Arenaceous rocks	Non-siliceous cementing material	140kN		75%
	Siliceous cementing material	110kN		75%
Diamictites (tillite)		200kN		70%
Argillaceous rocks		180kN	125kN	-
Other rock types		110kN		75%

<b>TABLE M1105/2: AGGREGATE CRUSHING VALUE</b>	
<b>ROCK TYPE</b>	<b>ACV, MAX</b>
Arenaceous: without siliceous cementing matrix	27%
Arenaceous: with siliceous cementing matrix	29%
Diamictites (tillite)	21%
Argillaceous rocks	24%
Other rock types	29%

TABLE M1105/3: CRUSHED STONE BASE AND SUBBASE: MATERIAL REQUIREMENTS		
MATERIAL CHARACTERISTIC		TYPE OF MATERIAL
		<b>G3</b>
Parent Material		Sound rock, boulders or coarse gravel
Additional Fines		May contain up to 15% by mass approved natural fines not obtainable from parent rock. Added fines shall have a LL not exceeding 25 and PI not exceeding 6
Strength		10% Fines Aggregate Crushing Value (10% FACT) determined in accordance with TMH1 method B2, should be not less than the appropriate value in Table M1105/2, column 3. The Aggregate Crushed value (ACV), determined in accordance with TMH1 method B1, shall not exceed the appropriate value in Table M1105/2
Durability		The material shall comply with the requirements
Flakiness Index		Flakiness index, determined in accordance with TMH1 method B3, shall not exceed 35 on each of the –25,5 + 19mm fraction and the –19 + 13,2 fraction
Fractured faces		For crushed materials at least 50% by mass of the fractions retained by each standard sieve 4,75mm and larger shall have at least one fractured face
Atterberg Limits	Fraction (mm)	LL shall not exceed 25 PI shall not exceed 6
	-0,425	LS shall not exceed 3% In case of calcrete the PI shall not exceed 8 (% passing 0,425mm sieve) $LS \leq 170$
	-0,075	If chemical modification is required the PI of the –0,075mm fraction after modification shall not exceed 10
Soluble Salts		See additional requirements
Nominal Maximum Size		26,5mm
Grading	Nominal aperture size of sieve (mm)	Percentage passing sieve, by mass
	37,5	
	26,5	100
	19,0	85-95
	13,2	71-84
	4,75	42-60
	2,00	27-45
	0,425	13-27
	0,075	5-12
Coarse Sand Ratio (See Definition in Subclause 360(c)(i)(5))		Shall not be less than 35% and shall not exceed 50% in respect of the target grading
Compaction Requirements		98% or 100% of modified AASHTO density (as specified)

(b) Stabilising Agent

The stabilising agent shall be CEM I cement (OPC) or hydrated lime and shall comply with the requirements of category ENV 197-1 or SABS 824 respectively.

(c) Hot mix Asphalt Base and surfacing mix requirements

The mix shall be a continuously graded asphalt and shall have the following properties:

<b>TABLE M1105/4: PROPERTIES FOR CONTINUOUSLY GRADED ASPHALT BASE AND SURFACING</b>	
<b>PROPERTY</b>	<b>RANGE</b>
Marshall stability (kN)	8 – 15
Marshall flow (mm)	2 – 4
Stability/Flow (kN/mm)	2,5 min
Indirect tensile strength @ 25°C (kPa)	1 000 min
Dynamic creep modulus (Mpa)	15 min
% Air voids	3 - 6
Immersion index %	80 min

A 60/70 penetration grade bitumen shall be used and the binder type shall comply with the requirements of SABS 307 (1972) amended May 1997.

Grading limits and mix proportions are given in table M1105/2.

<b>TABLE M1105/5: GRADING LIMITS AND MIX PROPORTIONS FOR CONTINUOUSLY GRADED ASPHALT BASE AND SURFACINGS</b>			
<b>PERCENTAGE PASSING THROUGH SIEVE BY MASS</b>			
<b>SIEVE SIZE (mm)</b>	<b>ASPHALT BASE</b>	<b>ASPHALT SURFACING</b>	
	<b>26,5mm MAX</b>	<b>MEDIUM</b>	<b>FINE</b>
53,000	-	-	-
37,500	-	-	-
26,500	100	-	-
19,000	85 - 95	-	-
13,200	71 - 84	100	-
9,500	62 - 78	82 - 100	100
6,700	-	-	-
4,750	42 - 60	54 - 75	64 - 88
2,360	30 - 47	35 - 50	45 - 60
1,180	21 - 37	27 - 42	35 - 54
0,600	15 - 30	18 - 32	24 - 40
0,300	11 - 24	11 - 23	16 - 28
0,150	8 - 19	7 - 16	10 - 20
0,075	5 - 12	4 - 10	4 - 12
<b>NOMINAL MIX PROPORTIONS (BY MASS)</b>			
Aggregate	94,0 %	93,0 %	93,0 %
Bitumen	5 %	6,0 %	6,0%
Active filler	1,0 %	1,0 %	1,0 %

(d) Tack coat

The tack coat shall be 60% cationic emulsion complying with SABS 548.

#### M1106 MEASUREMENT AND PAYMENT

##### M1100 PAVEMENT LAYER REPAIR

<u>Item</u>	<u>Unit</u>
M110.01 Removal and excavating material from existing pavements (except milled material)	
(a) Areas up to 50m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(b) Areas larger than 50m <sup>2</sup> but smaller than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(c) Areas larger than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of material excavated from the existing pavement irrespective of the type of material. The quantity shall be computed in accordance with the authorised dimensions of the excavation.

The tendered rate shall include full compensation for demarcating the excavation and excavating and disposing and/or stockpiling of the material, including haul over a free-haul distance of 1,0km.

Payment will not distinguish between the different types of pavement layer and surfacing material excavated.

<u>Item</u>	<u>Unit</u>
M110.02      Milling out material from existing pavements	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of material milled out from the existing pavement irrespective of the type of material. The quantity shall be computed in accordance with the authorised dimensions of the excavation.

The tendered rate shall include full compensation for demarcating the excavation and excavating and disposing and/or stockpiling of the material, including haul over a free-haul distance of 1,0km.

Payment will not distinguish between the different types of pavement material milled or the size of the repaired area.

<u>Item</u>	<u>Unit</u>
M110.03      Backfilling of base layer for surface failures with: (98% of modified AASHTO density.)	
(a)      Chemically stabilised gravel excavated from the existing pavement	
(i)      Areas up to 50m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(ii)      Areas larger than 50m <sup>2</sup> but smaller than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(iii)      Areas larger than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(b)      Emulsion-treated crushed stone pavement	
(i)      Areas up to 50m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(ii)      Areas larger than 50m <sup>2</sup> but smaller than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(iii)      Areas larger than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(c)      Asphalt base (hot mixed)	
(i)      Areas up to 50m <sup>2</sup>	ton (t)
(ii)      Areas larger than 50m <sup>2</sup> but smaller than 100m <sup>2</sup>	ton (t)
(iii)      Areas larger than 100m <sup>2</sup>	ton (t)
(d)      Asphalt surfacing (continuously graded medium)	
(i)      Areas up to 50m <sup>2</sup>	ton (t)
(ii)      Areas larger than 50m <sup>2</sup> but smaller than 100m <sup>2</sup>	ton (t)
(iii)      Areas larger than 100m <sup>2</sup>	ton (t)

The unit of measurement shall be the cubic metre of chemically stabilised gravel or emulsion-treated crushed stone or the ton of asphalt placed in accordance with the specified requirements. The quantity will be computed in accordance with the authorised dimensions of the layer in the case of gravel or crushed stone and in accordance with the certified weighbridge tickets issued in the case of asphalt. Payment will not be made for wasted material. Distinction shall be made for the size of repaired area.

The tendered rate shall include full compensation for providing all the material, irrespective of its origin, for all mixing, placing, trimming or cutting the edges of existing surfacing, compacting, including the floor, and finishing as specified for all transport, work in restricted areas, and also for

all machinery, equipment, labour, tack coat, supervision and other incidentals for executing the work as specified.

The tendered rate for chemically stabilised gravel shall also include full compensation for stabilising and providing the stabilising agent.

The tendered rate for emulsion-treated crushed stone shall also include full compensation for supplying and mixing with emulsion, stabilising and providing the stabilising agent.

Payment for hot mixed asphalt base and surfacing will not distinguish between the various types of asphalt and will allow for priming.

<u>Item</u>	<u>Unit</u>
M110.04 Backfilling of pavement layers to compaction as specified.	
(a) Subbase layer (95% of modified AASHTO density)	
(i) Areas up to 50m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(ii) Areas larger than 50m <sup>2</sup> but smaller than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(iii) Areas larger than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(b) Selected layer (93% of modified AASHTO density)	
(i) Areas up to 50m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(ii) Areas larger than 50m <sup>2</sup> but smaller than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(iii) Areas larger than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(c) Fill layer (90% of modified AASHTO density)	
(i) Areas up to 50m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(ii) Areas larger than 50m <sup>2</sup> but smaller than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )
(iii) Areas larger than 100m <sup>2</sup>	cubic metre (m <sup>3</sup> )

The unit of measurement shall be cubic metres of material to be backfilled.

The tendered rate shall include full compensation for materials, labour, tools and equipment necessary for backfilling material as specified. Distinction shall be made for the size of the repaired area.

<u>Item</u>	<u>Unit</u>
M110.05 Binder variations	
(a) Penetration-grade bitumen	ton (t)
The unit of measurement in respect of increases or decreases in the bituminous binder from that specified in the nominal mix shall be the ton.	
<u>Item</u>	<u>Unit</u>
M110.06 Variation in active filler content	
(a) Cement	ton (t)
(b) Lime	ton (t)

The unit of measurement in respect of increases or decreases in the active filler content for base and surfacing mixtures from that specified in the nominal mix shall be the ton. No payment shall be made for "inert" filler added by the Contractor.

Item

Unit

M110.07 Overhaul for material hauled in excess of 1,0km free-haul

(a) Spoil material

m<sup>3</sup>-km

The unit of measurement shall be the cubic metre of material hauled in excess of 1,0km, the volume of material measured loose in truck of excavated material transported to spoil, all multiplied by the overhaul distance.

The tendered rate shall include full compensation for hauling the material in excess of the free-haul distance.

**SERIES M1000 : PAVEMENT MAINTENANCE**

**SECTION M1200 : REPAIR OF POTHOLES, EDGE BREAKS AND SURFACE FAILURES**

**CONTENTS**

M1201	SCOPE
M1202	EXECUTION OF WORK
M1203	ACCEPTANCE CRITERIA
M1204	EQUIPMENT
M1205	MATERIAL
M1206	MEASUREMENT AND PAYMENT

**M1201 SCOPE**

This section covers the repair of potholes, edge breaks and surface failures on an ad hoc basis. A pothole is defined as a surface failure, which has extended into the base layer forming a hole with an area smaller than  $0,5\text{m}^2$ . Potholes are isolated and are not associated with displacement. Potholes with areas larger than  $0,5\text{m}^2$  must be treated as pavement failures.

Edge break is defined as the failure of the edge of the surfacing up to a maximum width of 300mm from the continued edge of the surfacing usually accompanied by a loss of gravel on the shoulder. Edge breaks wider than 300mm will be treated as pavement failures.

Surfacing failures often preceded by map or diamond-like cracking is the breaking up of only the surfacing layer (seal or asphalt) exposing but not affecting the underlying layer. The resulting depression is usually of uniform thickness. Surfacing failures with areas larger than  $2\text{m}^2$  must be treated as pavement failures.

Distinction shall be made in terms of temporary and permanent repairs of potholes, edge breaks and surface failures. Temporary repairs shall only be undertaken if instructed or authorised by the Engineer.

**M1202 EXECUTION OF WORK**

Potholes, edge breaks and surface failures shall consist of trimming away ravelled edges and loose material to the full depth and the backfilling thereof as specified.

**(a) Excavation**

Potholes: The existing material shall be removed in a neat rectangle to sound base, with a minimum dimension of 200mm x 200mm. All sides shall be perpendicular or parallel to the direction of traffic.

Edge breaks: Loose and cracked edges shall be trimmed back to a neat rectangular shape, parallel and perpendicular to the centre line of the road to sound surrounding surfacing or base layer. All edges shall be saw cut to a minimum depth of 30mm below the road surface and the maximum thickness of each layer shall be 50mm.

Temporary partial-depth concrete pothole repairing: All loose or fractured concrete within the spalled area shall be removed by means of light hand held pneumatic tools down to solid concrete. The cavity shall be thoroughly cleaned using brushes or compressed air.

Surfacing failures: The surface repair shall have a neat rectangular shape, at right angles to the direction of traffic. Before starting any repair work the areas adjacent to

the holes should be checked for debonding by tapping the surface with a hammer. A dull sound indicates lack of bond. Debonded material must be removed and can be lifted off with a flat spade.

(b) Backfilling

After completion of the excavation, the Engineer shall be afforded the opportunity to inspect it. The floor of the excavation shall be cleaned of all undulations to ensure a firm flat base and sides and shall be tacked with 60% cationic stable-grade bitumen emulsion at a rate of 0,6 litre per m<sup>2</sup>. Continuously graded medium asphalt shall be placed and compacted to the level of the existing adjacent surfacing.

The asphalt shall be placed and compacted in layers not exceeding 40mm in thickness after compaction. The asphalt shall be compacted as specified in section M1100: Pavement Layer Repairs

Temporary partial-depth concrete pothole repairing shall be backfilled with continuously graded asphalt surfacing as specified in section M1100: Pavement Layer Repairs. The asphalt shall be backfilled using hand compacting equipment. The Contractor will ensure that the asphalt is protected against "pick up" by the compactors. All coarse aggregate will be removed from the shallow areas in the excavation to provide a smooth riding surface, flush with the surrounding concrete surface. Before backfilling can be done, the bottom and sides of the excavation, shall first be painted with 60% anionic spray grade emulsion at a rate of 0,5 litre per m<sup>2</sup>. The Contractor shall arrange the work so as to allow enough time for the emulsion to break before asphalt can be placed. No excavation may be left open during the night. No joints need to be constructed between the asphalt and the concrete.

Surfacing failures should be well cleaned (if contaminated with fumes by washing) and a tack coat of 60% cationic emulsion applied at a rate of 0,40 litre per m<sup>2</sup> (road penetration and distribution of the tack coat must be achieved). This can be done by scrubbing the floor and sides with a bristle broom. The hole must be backfilled with either coarse slurry or fine asphalt.

The composition and compaction requirement for the slurry and fine asphalt shall be as specified in section M1100: Pavement Layer Repair and section M1600: Surface Treatment of Surfaced Roads.

(c) Temporary repair of potholes and edge breaks

A cold premixed bituminous mixture can be used for temporary pothole or edge break repair. Within a period of two months after placement of the coldmix, the coldmix must be replaced by hot asphalt mix as specified.

The mixture shall either be obtained from approved commercial sources or prepared and mixed in a suitable concrete or other approved type of mixer in the following proportions:

- |       |  |   |
|-------|--|---|
| (i)   | 9,5mm nominal sized aggregate:   | 1 part  |
| (ii)  | 6,7mm nominal sized aggregate:   | 1 part  |
| (iii) | Crusher sand (fine grade):   | 1 part  |
| (iv)  | 60% Stable mix-grade emulsion<br>(Prepared from 80/100 penetration<br>grade bitumen) | Between 125 and 150 litre per m <sup>3</sup><br>aggregate mix bitumen |
| (v)   | 1% cement to promote breaking  |   |



Before spreading the mixture, the surface shall be prepared by painting it with one layer of bituminous emulsion at a rate of 0.6 litre per m<sup>2</sup>, which shall be allowed to dry. The mixture shall then be placed on the areas to be sealed and screeded off in a layer of uniform thickness. After the emulsion has broken and the layer has attained sufficient stability, it shall be compacted with a steel-wheeled roller or whacker. The thickness of the layer shall be the same as that of the adjacent seal.

#### M1203 ACCEPTANCE CRITERIA

(a) Quality

The repaired area shall be rectangular in shape.

The edges of the completed surfacing shall not be above the existing surface by more than 3mm. The edges or any part of the repaired area shall not be below the surrounding road surface.

The thickness of the asphalt surfacing at any point shall be 40mm ± 10mm.

The crossfall of the completed area shall be equal to that of the adjacent surface to within a tolerance of ± 0.5% crossfall.

When tested with a 3m straight edge laid parallel to or at right angles to the road centreline the surface of the area shall not deviate from the bottom of the straight edge by more than 5mm.

(b) Acceptance criteria

Potholes: Potholes must be repaired within two days after instruction from the Engineer or detection by route services.

Edge breaks: Edge breaks must be repaired within 14 days after instruction from the Engineer or detection by route services.

Surface failures: Surface failures must be repaired within two days after instruction from the Engineer or detection by route services.

(c) Response time to correct deficiency

Potholes and surface failures have to be repaired within the time specified.

(d) Reduced payments

Failure by the Contractor to comply with the minimum standard and response time for pothole, edge breaks and surface failure repairs will result in penalties as specified in the Project Specifications.

#### M1204 EQUIPMENT

All equipment shall be suitable for the specified use and extent of working areas and shall be capable of obtaining the specified results.

Only approved cutting or sawing equipment may be used for cutting or sawing asphalt layers. The equipment shall be capable of cutting asphalt layers to depths of 200mm in one operation without fragmenting the material, and in straight lines within the required tolerances.

The following items of plant and equipment shall also be available and in good working order:

A vibratory roller having a mass approximately equal to that of a Bomag 90 or similar vibratory roller, with an adjustable amplitude and frequency of vibration.

A mobile compressor capable of producing at least 3m<sup>3</sup>/minute compressed air at 750kPa.

Appropriate paving breakers.

Manually operated pneumatic compactors as required.

Appropriate concrete mixers.

M1205 MATERIAL

The material used for potholes, edge breaks and surface failures shall be as specified in section M1100: Pavement Layer Repairs and section M1600: Surface Treatment of Surfaced Roads.

M1206 MEASUREMENT AND PAYMENT

M1200 REPAIR OF POTHOLES

<u>Item</u>	<u>Unit</u>
M120.01 Pothole repair (< 0,5m <sup>2</sup> ) using hot mix continuously graded asphalt	number (No)

The unit of measurement for repairing shall be the number of potholes repaired, irrespective of the thickness or number of layers.

The tendered rate shall include full compensation for procuring, trimming the edges of the existing surface, furnishing, and storing of all materials, providing and transporting all labour and equipment necessary for cutting back the edges, excavation, removing excavated and loose material and disposal thereof, priming, backfilling with the approved product, compaction and trimming as specified.

M1210 REPAIR OF EDGE BREAKS

<u>Item</u>	<u>Unit</u>
M121.01 Repairing edge breaks using hot mix continuously graded asphalt	metre (m)

The unit of measurement for repairing edge breaks shall be the metre of edge breaks repaired, irrespective of the thickness or number of layers.

The tendered rate shall include full compensation for compacting the surface on which the new edge is to be constructed, trimming the edges of the existing surface, procuring, furnishing, and mixing all materials and compacting and trimming the asphalt to the required lines and levels. It shall also include full compensation for applying a tack coat of emulsion to the surface to be treated.

The tendered rate shall include full compensation for all transport, handling, labour, material and all incidentals necessary to complete all the work as specified.

M1220 REPAIR OF SURFACE FAILURES

<u>Item</u>	<u>Unit</u>
M122.01 Surface failure repair using hot mix continuously graded asphalt	number (No)

The unit of measurement shall be the number of surface failures repaired, irrespective of the thickness.

The tendered rates shall include full compensation for procuring, trimming the edges of the existing surface, furnishing, and storing of all materials, providing and transporting all labour and equipment necessary for cutting back the edges, excavation, removing excavated and loose

material and disposal thereof, priming, backfilling with the approved product, compaction and trimming as specified.

#### M1230 TEMPORARY REPAIR

<u>Item</u>		<u>Unit</u>
M123.01	Temporary repair of potholes, edge breaks and surface failures using cold mix asphalt surfacing from the following sources:	
(a)	Commercial sources (indicate type)	number (No)
(b)	Mixed on site as specified	number (No)

The unit of measurement shall be the number of potholes, edge breaks and surface failures repaired, irrespective of the thickness or number of layers.

The tendered rates shall include full compensation for procuring, furnishing, and storing of all materials, providing and transporting all plant, labour and equipment necessary for cutting back the edges, excavation, removing excavated and loose material and disposal thereof, priming, backfilling with the approved product, compaction and trimming as specified in this section.

<u>Item</u>		<u>Unit</u>
M123.02	Temporary partial-depth pothole repair of concrete with asphalt surfacing	
(a)	Removal of damaged concrete and replacement of damaged concrete with asphalt surfacing (indicate type)	number (No)

The unit of measurement for the replacement of damaged concrete with asphalt surfacing shall be the number of potholes repaired.

The tendered rate shall include for all the necessary labour, plant, equipment, tools and materials, lighting, removal of damaged concrete and any additional requirements for night work, for preparation of the surface to be primed, supplying and applying the bituminous tack coat, supplying, mixing, transporting, placing, compacting, striking off, finishing, waste and disposal thereof.

**SERIES M1000 : PAVEMENT MAINTENANCE**

**SECTION M1300 : CRACK SEALING**

**CONTENTS**

M1301	SCOPE
M1302	DESCRIPTION OF CRACKS AND REPAIR METHODS
M1303	EXECUTION OF WORK
M1304	MATERIAL
M1305	EQUIPMENT
M1306	ACCEPTANCE CRITERIA
M1307	MEASUREMENT AND PAYMENT

**M1301 SCOPE**

This section deals with all work in connection with the sealing of cracks in the road surface. No cracks shall be sealed unless so ordered by the Engineer.

Cracks shall be classified as either active or passive cracks. The active cracks generally originate from levels below the surfacing while the passive cracks apply to the surfacing.

**Active cracks**

- Stabilisation cracks (primary cracks in a block pattern developing with time into secondary cracking with pumping of fines)
- Volcano cracks (often stabilisation cracks in low traffic areas like the shoulder)
- Expansive soil cracks (often parallel to road edge)
- Longitudinal cracks (settlement/slip)

**Passive cracks**

- Surfacing cracks (old and brittle surface or over-stressing of the surfacing layer).
- Single cracks (long, transverse and random).
- Crocodile cracking (over-stressing of base/subbase) – usually with rutting and limited to the wheel tracks.

**M1302 DESCRIPTION OF CRACKS AND REPAIR METHODS**

**Active cracks**

**(a) Stabilisation cracks**

**(i) Description**

Stabilisation (“Block”) cracking is active cracking with a very distinctive block form which with time deteriorates to secondary cracking at closer spacings and eventually if untreated forms large open closely spaced cracks. These cracks are associated with cemented pavement layers.

**(ii) Repair method**

Blow out all loose material and grit from the cracks. Prime cracks with an inverted emulsion primer as specified. Fill the cracks with a stable grade anionic emulsion modified with an anionic latex (8% nett rubber on nett bitumen), or a cationic spray grade emulsion modified with a neutralised latex. Materials are to be injected with the equipment under pressure as

specified. The Contractor must take care not to apply prime or emulsion on the surface outside the cracks and all excess material shall be removed.

Where the block cracking degenerates to secondary cracking initially these are hairline cracks with pumping of fines. These cracks shall be treated with a geotextile bandage to reduce or stop the pumping of fines. Where the secondary cracks are open they shall be treated as open block cracks as specified above.

Where isolated areas of small blocks are rocking under traffic these should be removed and repaired under section M1100: Pavement Layer Repairs.

(b) Volcano cracks

(i) Description

Volcano cracks are active cracks, which usually occur along with stabilization cracks in the base in areas where there is little or no traffic such as on paved shoulders. The cracks are open up to 10mm wide with a raised edge like rim of a volcano.

(ii) Repair method

The crack shall be prepared by blowing out all loose material under pressure. The surface for a width of 300mm on either side of the crack should be treated with a rejuvenator or a solution of 1 part RC250 (or similar) and two parts diesoline. The crack should be primed with an inverted emulsion prime as specified, tacked with a modified emulsion and filled with a rubber crumb slurry as specified. The raised areas around the crack shall be compacted with a vibratory roller (Bomag 90 or similar) until the area is level with the surrounding surface.

(c) Expansive soil cracks and longitudinal cracks

(i) Description

Expansive soil cracks are active cracks with cyclical movements related to the wet and dry seasons of the year. These cracks are generally open wide and deep extending down through the pavement to the subgrade. The cracks are often parallel to the centreline and occur mainly towards the edge of the road along the extent of shallow fills, fields and marshy areas.

Longitudinal cracks close to the edge of the road which are open, wide and deep, caused by settlement often occur where there are newly constructed high fills or widened sections and are normally parallel to the road centreline. Usually there is little vertical displacement across the settlement cracks. Conversely where slip failures occur in the pavement fill there are often noticeable vertical steps across the crack (lower towards the outside of the pavement) and the cracks form an arc towards the shoulder edge rather than a straight crack.

(ii) Repair method

The Contractor shall clean out loose material from the crack and fill the cracks with fine slurry of clean fine sand and lime (in equal parts) to the underside of the base layer. Alternatively wider cracks could be filled with fine dry sand. More than one filling may be necessary to fill the crack. Prime the crack with an inverted emulsion prime (MSP1), then tack the crack with a modified emulsion and fill the crack with a rubber crumb slurry as specified. Allow the emulsion to break and then apply a geofabric bandage or a prefabricated bitumen rubber seal patch. Where cracks occur in the fill slope fill the crack with bentonite (2%) and sand slurry to

prevent ingress of water. Treat the top 100mm of fill material for a spade width about the crack with 2% bentonite and water and compact lightly to the shape of the slope.

#### Passive cracks

##### (d) Surfacing cracks

###### (i) Description

Surfacing cracks occur randomly over the road surface in a map format (diamond shape). These cracks are often referred to as map cracks. In extreme cases the surface deteriorates to a pattern which resembles and can be mistaken for crocodile cracks. This distress mode is not accompanied by any marked deformation or pumping of fines.

###### (ii) Repair method

Blow out the cracks to remove all loose material. Apply MSP1 inverted bitumen emulsion to the surface and squeegee the emulsion into the cracks. Apply the fine slurry as specified in section M1600: Surface Treatment of Surface Roads and squeegee into the cracks.

##### (e) Crocodile cracks

###### (i) Description

Crocodile cracking is a series of small inter-linked near circular cracks often associated with pumping of fines in or after wet weather. It is accompanied by rutting of the pavement in the wheel-tracks and precedes pavement failure.

###### (ii) Repair method

Limited areas of crocodile cracking can be treated as a holding measure by applying a geofabric "bandage" or a prefabricated road patch. The bandage should be protected/armoured by treating it with a further application of latex modified emulsion and a nominal 4,75mm grit (the use of crusher sand is not recommended) as per the supplier's specification.

##### (f) Long cracks

###### (i) Description

Fairly straight single cracks which often occur along construction joints in the surfacing or base. Also quite common where the surfacing meets concrete channels and kerbs. The cracks are generally open but not wide (say less than 5mm). However, they tend to catch and hold water. Other random single passive cracks can be grouped under this description.

###### (ii) Repair method

###### Narrow cracks (< 3mm)

Blow out all loose material and grit from the cracks. Prime cracks with an inverted emulsion primer as specified. Fill the cracks with a stable grade anionic emulsion modified with an anionic latex (8% nett rubber on nett bitumen), or a cationic spray grade emulsion modified with a cationic latex. Materials are to be injected with the equipment under pressure as specified. The Contractor must take care not to apply prime or emulsion on the surface outside the cracks and all excess material shall be removed.

### Wider cracks

Cracks could be filled with fine dry sand. More than one filling may be necessary to fill the crack. Prime the crack with an inverted emulsion prime (MSP1), then tack the crack with a modified emulsion and fill the crack with a rubber crumb slurry as specified. Allow the emulsion to break and then apply a geofabric bandage or a prefabricated bitumen rubber seal patch. Where cracks occur in the fill slope fill the crack with bentonite (2%) and sand slurry to prevent ingress of water.

## M1303 EXECUTION OF WORK

### (a) Crack cleaning

The cracks shall be blown out with heated ("hot dog lance") or cold compressed air according to the method specified by the Engineer. All dirt, grit and other base or foreign matter shall be blown out and removed from the cracks and road surface.

### (b) Priming of cracks

Cracks shall be primed if specified using the prime injectors as detailed. The prime shall be jetted as deep as possible into the crack using compressed air propulsion. The sides of the cracks shall be thoroughly wetted without flooding the crack. The prime shall be allowed 12 hours to soak and dry, before the first application of crack sealant is applied. The primed cracks shall be kept clean at all times and if soiled it shall be re-cleaned at the Contractor's cost.

When heated air is used for crack cleaning, no priming will be required where so specified. In that case, the crack shall be filled with sealant within 8 minutes of the cleaning operation so that minimal heat is lost. If the crack is not filled within the prescribed time, the Contractor shall prime the crack at his own cost.

### (c) Precautions

The sealant shall only be applied with pressure type spray equipment to ensure that the cracks are filled rather than covered.

The Contractor shall ensure that all equipment is kept clean so as to prevent blockages and resulting poor workmanship.

### (d) Weather limitations

(i) The minimum road surface temperature at which the cracks will be sealed is 10°C.

(ii) No work will be allowed within 12 hours after rain has fallen on the sections to be sealed.

(iii) Crack sealing shall not take place when the conditions are excessively windy or dusty as determined by the Engineer.

### (e) General

The Contractor is to note that one application of the sealant is generally insufficient and that a repetition of the application of the binder will be required. This reapplication forms part of the measured metre of crack sealing completed and is not measured separately.

## M1304 MATERIAL

The type of bituminous binder/sealant used to seal/fill a crack will depend on the type of crack.

(a) Bituminous Binders

All bituminous binders, where applicable, shall conform to the following standards:

Penetration grade bitumens	:	SABS 307
Bitumen emulsions: Anionic	:	SABS 309
Bitumen emulsions: Cationic	:	SABS 548

(b) Prime

The prime shall consist of an "inverted emulsion" prime manufactured from a base bitumen of 80/100-penetration grade. An MSP1 prime or equivalent shall be used.

(c) Emulsion for cold applied sealant

The emulsion for the crack treatment shall consist of an Anionic Stable Grade Emulsion or Cationic Spray or Stable Grade Emulsion. When blended on site, "Revertex" or other rubber latex emulsion shall be added to the bitumen emulsion to give 8% net rubber on net bitumen content. If a proprietary brand blend is used, the constituents shall conform to the manufacturer's specification.

(d) Bitumen Rubber

(i) Rubber crumbs

The rubber obtained by processing and recycling tyres shall conform to the following:

<b>TABLE M1304/1: RUBBER CRUMBS</b>			
<b>Property</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Test Method</b>
Natural rubber content (m/m) as % of total hydro carbon content	30%	-	BS 903
Grading (m/m)			BR6T
Passing 1.18mm sieve	100%	-	SABITA
Passing 0.60mm sieve	40%	70%	
Passing 0.075mm sieve	-	5%	
Fibre length	-	6mm	BR6T
Relative density (t/m <sup>3</sup> )	1.10	1.25	BR9T

(ii) Extender Oil

The extender oil shall be a distillate of high aromatic and shall comply with the following requirements:

<b>TABLE M1304/2: EXTENDER OIL</b>	
Flash point	180°C minimum
Percentage saturates by mass	25% maximum
Percentage aromatic/unsaturated hydrocarbons	55% minimum

(iii) Diluent



The diluent shall be a hydrocarbon distillate.

(iv) Bitumen Rubber Blend

The actual value of penetration of the bitumen used shall also be stated on a certificate. The results of these tests must be reported to the Engineer. The bitumen rubber blend containing extender oil and/or diluent, where necessary, shall comply with the following requirements: -

<b>TABLE M1304/3: BITUMEN RUBBER BLEND</b>	
Percentage of rubber by mass of the total blend	20 – 24%
Percentage extender oil by mass of total blend	4% max.
Percentage diluent or cutter by mass of total blend	5% max.
Blending/reaction temperature °C	170 - 210°C
Reaction time since last addition of rubber crumbs, hours	0,5 - 4,0 hrs

The pre-blended binder shall meet the following specifications when sampled five minutes, or less, before application: -

<b>TABLE M1304/4: PRE-BLENDED BINDER</b>		
<b>Property</b>	<b>Limit</b>	<b>Test Method</b>
Ring & ball softening point	65°C (min)	ASTM D36
Resilience	13% - 35%	BR 2T
Dynamic Viscosity at application temperature (Haake)	20 – 40 dPa.s	BR 5T
Flow @ 60°C	0 - 25mm	BR 4T

The applicable bitumen rubber test methods appear in “Manual 3, 1988” of the SABITA publication entitled “Test Methods for Bitumen-rubber used in Seals”.

The Contractor shall supply the Engineer with the time/temperature relationships of the abovementioned properties for the specific product prior to commencement of the operation.

(e) Modified Bitumen

(i) General

The particular values within the limits of the specifications given below will depend on the specific application of the product and the technology employed by the manufacturer.

For each batch of modified bitumen, the manufacturer shall issue a certificate stating that the processes have been controlled during manufacture and handling.

The actual value and range of penetration of bitumen shall also be stated on the certificate. The results of these tests must be reported to the Engineer daily.

(ii) Modified Bitumen Blend

The modified bitumen blend shall comply with the following requirements: -

<b>Property</b>	<b>Limit</b>	<b>Test method</b>
Grade Base Bitumen	80/100	SABS 307
Softening Point R&B (°C)	80 min	ASTM D36
Elastic recovery by means of ductilometer at 10°C	80 min	ASTM D113(mod)
Viscosity @ 165°C Pa.s	0,55 max	BR 5T

## (f) Weed Killer

Roundup or similar type of non-selective total herbicide, which is approved for this purpose by the Department of Agriculture.

(g) Rubber crumb slurry for filling cracks

This slurry is intended for filling wide cracks

The nominal composition of the rubber crumb slurry per volume shall be as follows: -

- 10,0 parts aggregate mixed as follows
  - 8 parts rubber crumbs
  - 2 parts crusher dust (2,36mm max size)
- 4,5 parts 60% anionic stable grade bitumen emulsion
- 1,1 parts SBR (net rubber) "Revertex" or equivalent
- 0,2 parts cement (CEM I)
- Water (as directed by the Engineer) (approximately 5 parts)

## M1305 EQUIPMENT

(a) Blowing out cracks

The Contractor must provide a mobile compressor capable of discharging 3m<sup>3</sup>/min compressed air at 750kPa pressure. The compressed air shall be free of deleterious matter that may adversely affect the bond between the sealant and the cracks. The compressor shall be free of oil and diesel leaks.

A lance shall be used to direct the force of the air into the cracks and must be manoeuvrable enough to follow the path of the crack accurately.

If hot air is specified, the compressed air must be heated by a hot air lance capable of achieving a temperature of 300°C in the combustion chamber.

(b) Prime injectors

A special prime injector for injecting prime into open cracks using compressed air propulsion shall be manufactured. Essentially the equipment shall consist of a blowpipe with nozzle to direct the jet of compressed air into the cracks, a venturi or

similar device shall be fitted to the blow pipe for sucking in prime from the storage vessel. A suitable throttling valve shall be fitted on the prime supply line to adjust the prime flow, i.e. to adjust the compressed air to prime ratio. The blow pipe shall be of approximately 20mm diameter steel tubing, threaded at the open end so that suitable bitumen spray nozzles can be fitted. The other end shall have a suitable coupling to connect to the compressor, complete with a shut-off valve to isolate the injector from the compressed air source.

The injectors, blowpipes, storage vessel interconnecting piping, *inter alia*, shall all be capable of safely withstanding the pressure generated by the compressors. Design sketches of the equipment shall be submitted to the Engineer for approval.

(c) Sealant

The sealant shall be applied through an applicator manufactured specifically for this purpose. Essentially the equipment for the hot sealant shall consist of a mobile vessel capable of heating the sealant to the required application temperature by indirect heat, controlled by a thermostat to prevent overheating. A calibrated thermometer shall be fitted in an accessible position to accurately measure the sealant temperature in the tank. Special pumps, which can deliver the sealant to the crack in a controlled fashion, shall be used.

Proprietary brand seals shall be applied as specified by the suppliers.

(d) Seal bandage

The bandage shall be applied according to the manufacturers specification and recommended applying techniques.

(e) Equipment for the application of modified bitumen emulsion in small cracks where applicable

The modified bitumen emulsion shall be applied in a controlled manner using pressure type spray equipment with lances fitted with 2mm nozzles. A backpack type spray unit may be used. Under no circumstances will buckets, watering cans or tins be used to apply the sealant.

(f) Rectifying raised crack edges

A vibrating pedestrian roller of (Bomag 90 or similar) shall be used to roll the raised crack edges.

M1306 ACCEPTANCE CRITERIA

The work shall be executed and finished strictly in accordance with the prescribed requirements.

The sealed cracks shall be watertight, look neat and the sealant shall not project above the road surface by more than 3mm.

M1307 MEASUREMENT AND PAYMENT

M1300 SEALING OF ACTIVE CRACKS

<u>Item</u>	<u>Unit</u>
M130.01	Cleaning of active cracks with hot compressed air and sealing the crack as specified for:
(a)	Stabilisation cracks
(i)	Without bandage
	metre (m)

(ii)	With bandage (state type and size) (Class 3 or similar approved by Engineer)	metre (m)
(b)	Volcano cracks	metre (m)
(c)	Expansive side cracks	metre (m)
(d)	Longitudinal cracks	metre (m)

The unit of measurement for item M130.01 (a), (b), (c) and (d) shall be the metre of crack sealed as specified measured after the crack has been sealed to the satisfaction of the Engineer.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment and labour, for cleaning the crack with hot compressed air as specified, applying the sealant, re-applications where necessary or applying the seal bandage, cleaning, curing, finishing and all other incidentals necessary for hot sealing the cracks as specified.

<u>Item</u>		<u>Unit</u>
M130.02	Cleaning of active cracks with cold compressed air, priming and sealing the crack as specified:	
(a)	Stabilisation cracks	
	(i) Without bandage	metre (m)
	(ii) With bandage (state type and size)	metre (m)
(b)	Volcano cracks	metre (m)
(c)	Expansive side cracks	metre (m)
(d)	Longitudinal cracks	metre (m)

The unit of measurement for item M130.02 (a), (b), (c) and (d) shall be the metre of crack sealed as specified measured after the crack has been sealed to the satisfaction of the Engineer.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment and labour, for cleaning the crack with compressed air as specified, priming, applying the sealant, re-applications where necessary or applying the seal bandage, cleaning, curing, finishing and all other incidentals necessary for hot sealing the cracks as specified.

#### M1310 SEALING OF PASSIVE CRACKS

<u>Item</u>		<u>Unit</u>
M131.01	Cleaning of passive cracks with hot compressed air and sealing the cracks as specified for:	
(a)	Surfacing cracks	square metre (m <sup>2</sup> )
(b)	Crocodile cracks	square metre (m <sup>2</sup> )
(c)	Longitudinal cracks	metre (m)

The unit of measurement for item M131.01 (a) and (b) shall be the square metre of surface area sealed as specified measured after the cracks have been sealed to the satisfaction of the Engineer.

The unit of measurement for item M131.01 (c) shall be the metre of crack sealed as specified measured after the crack has been sealed to the satisfaction of the Engineer.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment and labour, for cleaning the crack with hot compressed air as specified, applying the sealant, re-applications where necessary or applying the seal bandage, cleaning, curing, finishing and all other incidentals necessary for hot sealing the cracks as specified.

<u>Item</u>	<u>Unit</u>
M131.02    Cleaning of passive cracks with cold compressed air, priming and sealing the cracks as specified for:	
(a)            Surfacing cracks	square metre (m <sup>2</sup> )
(b)            Crocodile cracks	square metre (m <sup>2</sup> )
(c)            Longitudinal cracks	metre (m)

The unit of measurement for item M131.02 (a) and (b) shall be the square metre of surface area sealed as specified measured after the cracks have been sealed to the satisfaction of the Engineer.

The unit of measurement for item M131.02 (c) shall be the metre of crack sealed as specified measured after the crack has been sealed to the satisfaction of the Engineer.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment and labour, for cleaning the crack with hot compressed air as specified, applying the sealant, re-applications where necessary or applying the seal bandage, cleaning, curing, finishing and all other incidentals necessary for hot sealing the cracks as specified.

M1320            CRACK SEALING PER INDIVIDUAL ITEM

<u>Item</u>	<u>Unit</u>
M132.01    Crack sealing per individual item (Items to be used on the instruction of the Engineer only)	
(a)            Blowing out of cracks	
(i)            Treated per metre	metre (m)
(ii)          Treated per area	hour (h)
(b)            Priming of cracks (MSP1 or similar)	metre (m)
(c)            Sealant (state type of hot applied sealant)	metre (m)
(d)            Seal bandage (state type of hot applied sealant and width)	metre (m)

The unit of measurement for sub-item M132.01 (a)(i), the complete process of blowing out cracks shall be the linear metre of crack blown out as specified.

The unit of measurement for sub-item M132.01 (a)(ii), the blowing out of the cracks over an area where sub-item M132.01 (a) (i) is not applicable, shall be the number of hours the compressor was actually used.

The tendered rates shall include full compensation for furnishing all equipment, labour, blowing out cracks, cleaning up and re-blowing if necessary, finishing and all other incidentals necessary for blowing out the cracks as specified. The tendered rates shall also include full compensation for furnishing and using the compressor, costs of fuel, operators, and maintenance, transporting the machine to and from site and for all other incidentals.

The unit of measurement for sub-item M132.01 (b), supplying and jetting the bitumen emulsion prime, shall be the metre of cracks primed.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment, for labour, jetting in the prime, cleaning, curing, finishing and all other incidentals necessary for priming the cracks as specified.

The unit of measurement for sub-item M132.01(c), sealing the crack shall be the metre of cracks sealed. Payment shall distinguish between a hot bitumen-rubber seal, or alternatively, the proprietary brand seals.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment, for labour, applying the sealant, re-applications where necessary, cleaning, curing, finishing and all other incidentals necessary for cold sealing the cracks as specified.

The unit of measurement for sub-item M132.01 (d), covering the crack shall be the metre of seal bandage applied over the crack.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment, for labour, applying the tack coat, the seal bandage and wearing coat, if applicable, cleaning, curing, finishing and all other incidentals necessary for applying the seal bandage according to the manufacturers specification and to the satisfaction of the Engineer.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment, for labour, applying the softening agent, allowing for the time delays specified, rolling of the crack, cleaning, curing, finishing and all other incidentals necessary to complete the works to the satisfaction of the Engineer.

**SERIES M1000 : PAVEMENT MAINTENANCE**

**SECTION M1400 : BLEEDING REPAIR**

**CONTENTS**

M1401	SCOPE
M1402	EXECUTION OF WORK
M1403	MATERIAL
M1404	ACCEPTANCE CRITERIA
M1405	MEASUREMENT AND PAYMENT

**M1401 SCOPE**

This section covers the work required to correct bleeding occurring on bituminous road surfaces.

**M1402 EXECUTION OF WORK**

**(a) General**

Bleeding shall be rectified by applying nominal size aggregates to the road surface according to the method instructed by the Engineer. The Engineer shall determine the size of aggregate, which the affected surface can accommodate.

Aggregates shall be coated with precoating fluid when required by the Engineer.

This work shall be effected only when the road temperature is high enough to promote embedment and adhesion.

Only a heavy pneumatic-tyre roller of at least 15 tons shall be used for rolling in the aggregate.

Sites for the stockpiling of untreated aggregates as well as precoated aggregates shall be prepared in such a manner that no grass, weed, dirt or other deleterious material will be included when the aggregates are loaded for use.

**(b) Repair methods**

Depending on the extent of bleeding, the Engineer may instruct one or more of the following methods for bleeding repair:

**(i) Method 1**

If required, power paraffin will be applied to the surface, at an application rate as specified or instructed by the Engineer.

The most suitable size of aggregate, as determined by the Engineer, shall be spread at the required application rates. Rolling shall commence and be continued until the Engineer is satisfied that all the aggregate has been properly embedded. No rolling shall be done in wet weather, cold weather or early in the morning when the surface is cold. A minimum road temperature of 30°C shall be required unless otherwise approved by the Engineer.

(ii) Method 2

A tack coat shall be applied to the surface, at an application rate as specified or as instructed by the Engineer. Immediately after the tack coat has been sprayed, it shall be covered with aggregate of the required size and at an application rate as specified or instructed by the Engineer. Initial rolling shall be done with a pneumatic-tyre roller until the area is covered at least three times. Any area deficient of aggregate shall have additional material added so as to leave the surface with a single layer of chippings. Final rolling shall be done with a pneumatic-tyre roller, applying a minimum of four passes. All loose aggregate shall be broomed off the surface.

A fog spray of either 60% or 30% anionic emulsion shall be applied to the surface of the aggregate by means of a pressure distributor at the required rate. When required, the Engineer may instruct a light blinding layer to be applied evenly over the indicated surface to prevent chippings from being picked up by traffic. The layer shall be spread evenly with hand brooms.

(c) Application rates

The following nominal application rates shall apply:

TABLE M1402/1 : NOMINAL RATES OF APPLICATION				
Nominal aggregate size (mm)	Paraffin (litre per m <sup>2</sup> )	Tack coat (litre per m <sup>2</sup> )	Aggregate (m <sup>2</sup> /m <sup>3</sup> )	Precoating fluid (litre per m <sup>3</sup> )
13,2	0,1	1,1	100	12
9,5	0,1	0,8	145	13
6,7	0,1	0,6	200	14

The fog spray shall be applied at a rate of 0,8 litre per m<sup>2</sup>.

The maximum permissible variation from the ordered rates of application shall be plus or minus 5%.

M1403 MATERIAL

(a) Aggregates

The aggregates for bleeding correction shall consist of 4,75mm nominal size aggregate or natural sand complying with the requirements of Table M1403/1 and Table M1403/2.

The Contractor shall provide the Engineer with proof that the aggregates comply with the specified requirements.



TABLE M1403/1: CRUSHED AGGREGATE		
Sieve size (mm)	Grade	Percentage by mass passing
		4,75mm nominal size
37,50	Grades 1 & 2	-
26,50		-
19,00		-
13,20		-
9,50		-
6,70		100
4,75		85-100
3,35		0-30
2,36		0-5
Fines content: Material passing a 0,425mm sieve (max)	Grade 1	1,0
	Grade 2	2,5
Dust content: Material passing a 0,075 mm sieve (max)	Grade 1	N/A
	Grade 2	1,0

TABLE M1403/2: SAND	
Sieve size (mm)	Percentage by mass passing through sieve
6,7	100
0,300	0-15
0,150	0-2

(b) Emulsion

Emulsion shall comply with the following specifications:

Anionic emulsion : SABS 309  
Cationic emulsion : SABS 548

(c) Precoating fluid

The type and application of the precoating fluid shall be sacrosote 70 or similar approved product.

The untreated stockpile of aggregate shall be thoroughly sprayed with water, which shall be allowed to drain off. The damp aggregate shall then be evenly coated with the precoating fluid applied at a rate as specified in Table M1402/1.

Precoated aggregate shall not be used immediately after precoating but shall be held in stockpile and turned frequently until the volatiles in the precoating fluid have evaporated and the aggregate is dry before being applied to the road.

M1404 ACCEPTANCE CRITERIA

Corrective work shall be carried out in such a manner as to blend in as far as possible with the adjacent road surfacing, with respect to texture and surface finish.

All loose stone broomed off the surface shall be suitably disposed of and not left in drainage channels or on the side of the road.

M1405 MEASUREMENT AND PAYMENT

M1400 BLEEDING REPAIR

<u>Item</u>	<u>Unit</u>
M140.01 Correction for bleeding (Method 1)	
Bleeding correction using the following aggregate sizes:	
(a) 13,2mm	square metre (m <sup>2</sup> )
(b) 9,5mm	square metre (m <sup>2</sup> )
(c) 6,7mm	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of road surface treated, and repaired by application of aggregate at required spread rates as specified for Method 1.

The tendered rates shall include full compensation for providing and furnishing materials including all transport and stockpile of aggregate if required.

<u>Item</u>	<u>Unit</u>
M140.02 Correction of bleeding (Method 2)	
Bleeding correction using the following aggregate sizes:	
(a) 13,2mm	square metre (m <sup>2</sup> )
(b) 9,5mm	square metre (m <sup>2</sup> )
(c) 6,7mm	square metre (m <sup>2</sup> )

The unit of measurement shall be square metre of corrected bleeding area as specified for Method 2.

The tendered rates shall include full compensation for furnishing all materials, spraying the tack coat, spreading of aggregate, rolling and all other incidentals necessary for completing the work as specified for Method 2.

<u>Item</u>	<u>Unit</u>
M140.03 Pre-coating of aggregate	cubic metre (m <sup>3</sup> )

The unit of measurement shall be cubic metre of material pre-coated.

The tendered rate shall include full compensation for pre-coating the material as specified, for procuring and furnishing the pre-coating material and for all handling, loading and off-loading of all materials.

<u>Item</u>	<u>Unit</u>
M140.04 Aggregate variations	
(a) 13,2mm	cubic metre (m <sup>3</sup> )
(b) 9,5mm	cubic metre (m <sup>3</sup> )

(c)	6,7mm	cubic metre (m <sup>3</sup> )
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The unit of measurement shall be cubic metre of increased or decreased aggregate applied as compared to the quantities required at nominal application rates.

<u>Item</u>	<u>Unit</u>
M140.05     Bituminous binder variations (type selected)	litre (l)

The unit of measurement of bituminous binder including precoating fluid, in respect of an increase or decrease in the specified nominal rates of application shall be the litres measured at spraying temperature. Payment for variations shall be made as specified in Clause M0226.

<u>Item</u>	<u>Unit</u>
M140.06     Application of fog spray:	
(a)           60% Spray-grade emulsion	litre (l)
(b)           30% Spray-grade emulsion	litre (l)

The unit of measurement shall be the litre of fog spray applied at the specified rate measured at spraying temperature.

The tendered rates shall include full compensation for furnishing the material and applying the fog spray as specified.

<u>Item</u>	<u>Unit</u>
M140.07     Aggregate for blinding using	
(a)           Natural sand	cubic metre (m <sup>3</sup> )
(b)           Crusher sand	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of sand measured in the hauling vehicles or in stockpile.

The tendered rates shall include full compensation for providing the material and applying the blinding coat complete as specified, and, should it be required, stockpiling the sand at an approved location.

**SERIES M1000 : PAVEMENT MAINTENANCE**

**SECTION M1500 : CRACK AND JOINT SEALING OF CONCRETE PAVEMENTS**

**CONTENTS**

M1501	SCOPE
M1502	EXECUTION OF WORK
M1503	MATERIALS
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M1505	MEASUREMENT AND PAYMENT

**M1501 SCOPE**

This section covers the sealing or resealing of existing joints and random cracks in existing concrete pavements.

Repairs to concrete are regarded as specialist work and shall be undertaken by nominated Subcontractors with relevant experience.

**M1502 EXECUTION OF WORK**

Resealing of joints and sealing of cracks in concrete pavements shall be done at the positions indicated on the drawings or as indicated by the Engineer.

**(a) Resealing of joints and cracks**

**(i) Preparation of joints for resealing**

The old deteriorated sealant in the top of the joint to be resealed shall be cut or scraped loose from each joint face with equipment that will not damage joint edges or the concrete surface. Care shall be taken not to damage, spall or bevel the joint edges.

The joints shall be initially cleaned to the full depth of the old sealant plus its backing material, as well as of all foreign material in the joints. A vacuum process, and not compressed air, shall be used to remove all loosened material from the joints. The Contractor shall continuously remove debris from the road surface and keep the surface clean. After the removal of the old material has been completed, refacing of the joint planes shall be done with an abrasive wheel or a power-driven concrete saw to provide the joints with widened top portions of the dimensions indicated on the drawings or as instructed by the Engineer. No sealant may be applied other than freshly cut concrete faces. The freshly cut concrete faces shall be degreased to such extent that adhesion of the sealant to the concrete in every respect satisfies the sealant manufacturer's guarantee.

Immediately after the sawing operation, the joint grooves shall be thoroughly vacuumed and washed out with a jet of clean water to remove all remaining loose material resulting from the sawing operation. Any slurry resulting from the wet sawing shall be removed from the road surface.

Sweeping up old joint material and other debris with handbrooms shall be a continuous process during joint preparation. The joints shall be finally cleaned again prior to resealing, but in no case shall the cleaning precede the sealant by more than 30m.

(ii) Preparation of cracks for sealing

Sealing shall be considered only for cracks that are open wide enough to permit entry of joint sealant or mechanical routing tools. The decision of whether a crack is to be sealed or not, shall rest with the Engineer. Sealant in previously sealed cracks shall be removed as described in Subclause M1502(a)(i) above.

A groove of at least 12mm wide by 18mm deep shall be made along the crack with a machine capable of closely following the path of the crack without causing excessive spalling or other damage to the adjacent concrete. The sawing or routing shall also be executed in such a way that the actual crack is always visible in the middle half of the widened slot. Cleaning of the cracks after the grooving operation shall be done as described in Subclause M1502(a)(i) above.

(iii) Sealing of cracks and joints

Before the sealing of cracks and joints it will be cleaned as prescribed in Subclause M1502 (a) (i) and (ii) above. The directions supplied by the manufacturer of the sealant used, shall be strictly complied with or as directed by the Engineer. The installation of sealants is to be done as soon after priming (if required) and placing the backing strip as reasonably possible to ensure that the slot is still clean and dry. In the event that the slot does become contaminated, damp, or wet, the backing strip and primer shall be re-applied prior to placing the sealant material, all at the Contractor's expense. The sealant shall also be applied within the time limit specified by the manufacturer after priming the sides of the slot.

The material used shall be DowCorning 890-SL low modulus silicone highway sealant or similar approved. This is cold pour, one part sealant and shall be applied by pumping through a long nozzle or with a hand gun. The pumping equipment shall be of sufficient capacity to deliver the necessary volume of material to completely fill the slot to the specified width and height sealant in one pass. The nozzle shall be of sufficient size and shape to closely fit into the slot and introduce the sealant inside the slot with sufficient pressure to prevent voids occurring in the sealant and to force the sealant into contact with the slot faces.

Any excess material on the surface of the pavement shall be removed and the pavement surface shall be left in a clean condition. Unless otherwise specified, the period of cure shall be in accordance with the manufacturer's recommendation. Vehicular or heavy equipment traffic shall not be permitted on the pavement in the area of the cracks until the sealant is tack free and debris from the traffic does not embed into the sealant.

The top surface of the sealant shall be between 3mm and 5mm below the paved surface.

M1503 MATERIALS

(a) Silicone sealant

The silicone sealant shall be a one-component material with low-modulus properties, which comply with the requirements as described in Table M1503/1.

(b) Additional materials for silicone sealant

The sealant shall be supported by a bond breaker backing strip, and, unless otherwise recommended by the manufacturer and approved by the Engineer, the faces of the joint groove shall first be treated with a primer.

Supporting and priming materials shall be compatible with adjacent materials or surfaces in contact with the materials and shall be in accordance with the recommendations by the manufacturer and subject to approval by the Engineer. Any primer used shall form a barrier layer between the silicone and the concrete.

(c) Primers, bond breakers and back-up material shall comply with instructions and recommendations issued by the manufacturer of the approved liquid sealant used.

(d) Liquid sealant for joints between concrete or asphalt pavement

The liquid sealant used in joints between concrete and asphalt pavement shall be of the hot-poured type and shall comply with the requirements of US Federal Specification SS-S-1401.

TABLE M1503/1 : PROPERTIES OF SILICONE JOINT SEALANT	
Tensile stress at 150% expansion determined in accordance with ASTM D412 (Matrix C) after seven days' curing at 23°C ± 2°C	0,31 MPa max
Extrusion rate, tested with a pneumatic caulking gun with a 3,18mm nozzle at a pressure of 0,62 MPa	
Material temperature - 18°C Material temperature - 38°C	Min 75g/min Max 250g/min
Relative density determined in accordance with ASTM D794 Method A	1,01 to 1,515
Shelf life	At least 6 months after manufactured
Ozone and UV resistance determined in accordance with ASTM D793-75	No pulverisation, cracking or loss of bond after 5000 hours
Adhesion to cement-mortar briquettes	0,34 MPa min
Non-adhesion period	Max 90 min
Deformation capability and adhesion	No adhesion or cohesion after 10 cycles at -18°C
Colour	Grey

M1504 ACCEPTANCE CRITERIA

The sealing shall be executed and finished strictly in accordance with the prescribed requirements.

M1505 MEASUREMENT AND PAYMENT

M1500 CRACK AND JOINT SEALING OF CONCRETE PAVEMENTS

<u>Item</u>	<u>Unit</u>
M150.01 Preparation and sealing or resealing of old joints and cracks in existing concrete pavements:	
(a) Expansion joints	metre (m)
(b) Construction joints and weakened plane joints:	
(i) (Width stated)	metre (m)

	(ii)	Etc for other widths	metre (m)
(c)	Cracks:		
	(i)	(Width stated)	metre (m)
	(ii)	Etc for other widths	metre (m)

The unit of measurement shall be the metre of each type of joint or crack prepared and sealed or resealed. No distinction will be made between joints or cracks through areas where the concrete has been repaired and other joints or cracks.

The tendered rates shall include full compensation for all labour, equipment, tools and materials, removing old sealant, backing material and any foreign material, refacing or enlarging the joint faces by sawing, routing of cracks to the specified dimensions, disposing of all debris, all cleaning work involved, installing back-up material where required, installing the bond breaker, applying the primer and mixing and applying the sealant, ensuring acceptable bond with existing work, and for any other operation needed to complete the work as specified and shown on the drawings.

**SERIES M1000 : PAVEMENT MAINTENANCE**

**SECTION M1600 : SURFACE TREATMENT OF SURFACED ROADS**

**CONTENTS**

M1601	SCOPE
M1602	APPLICATIONS
M1603	MATERIAL
M1604	CONSTRUCTION
M1605	MEASUREMENT AND PAYMENT

**M1601 SCOPE**

This section covers the application of slurry to existing road surfaces as texture treatment and for rut filling.

**M1602 APPLICATIONS**

**(a) Texture treatment**

This treatment shall be used whenever necessary to treat an existing surface with an open texture or excessive aggregate loss, using bituminous slurry.

Before the surface is treated with a slurry, a tack coat of 30% stable-grade emulsion shall be sprayed onto the surface at an application rate of 0,5 litre per m<sup>2</sup>.

Fine or medium grade slurry as specified in the Project Specifications shall be applied by hand over open-textured areas of the existing surfacing. Such areas could be odd-shaped or occurring in longitudinal strips on the existing road surface. The slurry shall be thoroughly worked into the open texture of the surfacing with squeegees and struck off neatly to expose the macro aggregates in the existing surfacing. Each application of slurry shall be compacted with a pneumatic roller to a minimum of six passes with a mass of at least 15 tons as soon as the slurry sets. Depending on the weather conditions no compaction shall be done after 6 hours or as instructed by the Engineer.

A mechanical spreader box may also be used to apply slurry if so directed by the Engineer. In such a case the nominal application rate for tender purposes is 0,004m<sup>3</sup>/m<sup>2</sup>.

The slurry may be mixed in a suitable concrete or other mobile mixer but the condition of the paddles and the mixer shall be such that complete blending of the constituents of the slurry is achieved.

**(b) Rut filling**

Medium or coarse grade slurry as specified in the Project Specifications shall be applied to fill ruts up to a maximum of 15mm in the existing surfacing, and shall be applied in either a single or double application using a spreader box fitted with rigid squeegees. The number of applications shall be determined by the Engineer depending on the depth of rut to be filled. Each application of slurry shall be compacted to a minimum of six passes with a pneumatic roller with a mass of at least 15.

The application of slurry shall, in all cases terminate at such a time during the day to allow traffic onto the slurry before sunset, or as indicated by the Engineer.



# M1603 MATERIAL

## (a) Aggregate for slurry

The aggregate for slurry shall be an approved crusher sand obtained from a parent rock having an ACV not exceeding 30 or a mixture of crusher sand and clean natural sand, where the mixture does not contain more than 25% of natural sand. The aggregate shall be clean, tough, durable, angular in shape, and shall conform to the following grading requirements:

<b>TABLE M1603/1: AGGREGATE FOR SLURRY</b>			
<b>Sieve Size (mm)</b>	<b>Percentage By Mass Passing</b>		
	<b>Fine Grade</b>	<b>Medium Grade</b>	<b>Coarse Grade</b>
6,700		100	100
4,750	100	82 - 100	70 - 90
2,360	90 - 100	56 - 95	45 - 70
1,180	65 - 95	37 - 75	28 - 50
0,600	42 - 72	22 - 50	19 - 34
02,300	23 - 48	15 - 37	12 - 25
0,150	10 - 27	7 - 20	7 - 18
0,075	4 - 12	4 - 12	2 - 8

The sand equivalent of aggregates according to TMH1 method B19 shall be 35 minimum.

To ensure proper adhesion, the immersion index of briquettes made with slurry aggregate and 80/100 penetration-grade bitumen shall be not less than 75 when tested in accordance with method C5 of TMH1.

## (b) Cement filler for slurry

CEM I cement (Portland cement) and CEM III A cement (PBFC) shall comply with the requirements of ENV 197-1.

Only one of the above materials shall be used throughout, as alternate usage will produce undesirable colour differences in the surface.

## (c) Bitumen emulsions

Anionic and cationic and stable-grade bitumen emulsion shall comply with the provisions of SABS 309 and SABS 548 respectively.

The type and grade of bituminous binder to be used shall be as specified in the Project Specifications.

## (d) Slurry mix

The composition of slurry shall be based on the following mass proportions for tender purposes:

(i)	Slurry aggregate (dry)	:	100 parts
(ii)	Stable-grade emulsion	:	16 parts
(iii)	Cement (Portland)	:	1,5 parts
(iv)	Water	:	± 15 parts

The volume of water in the slurry mix, shall be such that the consistency of the slurry is between 30mm and 40mm when measured in accordance with the test method, Appendix G in TRH3-1998.

## M1604 CONSTRUCTION

All areas shall be cleaned of all dust, dirt, oil or any other foreign matters that may be deleterious to the slurry. The area to be slurried shall be clearly demarcated.

Prior to applying the slurry, the tack coat shall be applied to the surface. The rate of application of slurry shall be measured in cubic metres of fine aggregate (saturated volume) contained in the slurry applied per square metre of surfacing as accepted by the Engineer.

The squeegee squad shall be allowed to complete the spreading of each batch discharged onto the road, using squeegees, before the next is discharged.

The Contractor shall ensure that the edges of the patch are finished to the specified widths and lines. All stones dislodged in the process of applying the slurry shall be removed on the same day on which the slurry seal has been applied. All spilled or excess of slurry shall be neatly removed from the road and disposed of as directed by the Engineer.

Any damage to the slurry seal by rain or traffic before the slurry has cured shall be rectified by the Contractor at the Contractor's own expense.

## M1605 MEASUREMENT AND PAYMENT

### M1600 SURFACE TREATMENT – TEXTURE CORRECTION

<u>Item</u>	<u>Unit</u>
M160.01 Application of slurry mixed on site	
(a) Tack coating using 30% bitumen emulsion	litre (l)
(b) Slurry applied for texture treatment (state grading and type of binder)	
(i) Applied by hand	cubic metre (m <sup>3</sup> )
(ii) Applied by spreader box	cubic metre (m <sup>3</sup> )

The unit of measurement for tack coat shall be the litre of emulsion measured at spraying temperature and for slurry applied by hand or spreader box shall be the cubic metre of saturated aggregate used.

The tendered rates shall include full compensation for procuring and furnishing all the materials, for mixing and applying the slurry, demarcating all areas to be treated and for all equipment, labour and incidentals necessary to complete the work as specified including compacting with pneumatic roller.

### M160.02 Application of slurry from commercial sources

<u>Item</u>	<u>Unit</u>
(a) Tack coating using 30% bitumen emulsion	litre (l)
(b) Slurry applied for texture treatment (state grading and type of binder)	
(i) Applied by hand	cubic metre (m <sup>3</sup> )
(ii) Applied by spreader box	cubic metre (m <sup>3</sup> )

The unit of measurement for tack coat shall be the litre of emulsion measured at spraying temperature and for slurry applied by hand or spreader box shall be the cubic metre of saturated aggregate used.

The tendered rates shall include full compensation for procuring and furnishing all the materials, for mixing and applying the slurry, demarcating all areas to be treated and for all equipment, labour and incidentals necessary to complete the work as specified including compacting with pneumatic roller.

#### M1610 SURFACE TREATMENT – RUT FILLING

<u>Item</u>	<u>Unit</u>
M161.01 Application of slurry for rut filling mixed on site	
(a) Slurry applied by spreader box with rigid squeegees in one application for rut filling (state grading and type of binder)	cubic metre (m <sup>3</sup> )
(b) Slurry applied by spreader box with rigid squeegees in two applications for rut filling (state grading and type of binder for each application separately)	cubic metre (m <sup>3</sup> )
(c) Tack coat using 30% bitumen emulsion for rut filling	litre (l)

The unit of measurement for tack coat shall be the litre of emulsion measured at spraying temperature and for slurry applied by hand or spreader box shall be the cubic metre of saturated aggregate used.

The tendered rates shall include full compensation for procuring and furnishing all the materials, for mixing and applying the slurry, demarcating all areas to be treated and for all equipment, labour and incidentals necessary to complete the work as specified including compacting with pneumatic roller.

<u>Item</u>	<u>Unit</u>
M161.02 Application of slurry for rut filling from commercial sources	
(a) Slurry applied by spreader box with rigid squeegees in one application for rut filling (state grading and type of binder)	cubic metre (m <sup>3</sup> )
(b) Slurry applied by spreader box with rigid squeegees in two applications for rut filling (state grading and type of binder for each application separately)	cubic metre (m <sup>3</sup> )
(c) Tack coat using 30% bitumen emulsion for rut filling	litre (l)

The unit of measurement for tack coat shall be the litre of emulsion measured at spraying temperature and for slurry applied by hand or spreader box shall be the cubic metre of saturated aggregate used.

The tendered rates shall include full compensation for procuring and furnishing all the materials, for mixing and applying the slurry, demarcating all areas to be treated and for all equipment, labour and incidentals necessary to complete the work as specified including compacting with pneumatic roller.

**SERIES M1000 : PAVEMENT MAINTENANCE**

**SECTION M1700 : REPAIR OF SLOPE FAILURES AND WASHAWAYS**

**CONTENTS**

M1701	SCOPE
M1702	EXECUTION OF WORK
M1703	ACCEPTANCE CRITERIA
M1704	MATERIALS
M1705	MEASUREMENT AND PAYMENT

**M1701 SCOPE**

This section covers the re-instatement of minor cut and fill slope failures and washaways which have occurred in the road due to landslides, sinkholes, erosion or any other occurrence. This section does not cover any major cut or fill failures and washaways where total reconstruction is necessary.

The Contractor's attention is drawn to the fact that re-instatement work is generally restricted by its nature in confined working areas.

**M1702 EXECUTION OF WORK**

The Engineer shall instruct the Contractor to proceed with the re-instatement work to be carried out at the slope failures and washaways once the cause of the condition has been identified.

**(a) Preparation of slipped or washaway site**

The material shall be carefully removed to firm material at the base and sides of the slips and washaways or to the depths as directed by the Engineer. The excavated material shall either be stockpiled where it shall be dried out if necessary for later re-use, or transported to spoil if so ordered by the Engineer.

The surfaces in excavations shall at all times be formed to shed water without ponding.

On completion of the excavation the Engineer will direct on site what treatment at the toes of slips and washaways is to be executed or any protective measures to be carried out if necessary to ensure stability of the reconstructed cut and fill batters.

**(b) Backfill**

On inspection of the excavated material or after laboratory testing the Engineer will indicate the source from where suitable material shall be imported to backfill the excavated area.

During the placing of the backfill material, the surfaces of layers shall at all times be formed to shed water without ponding.

Unless otherwise instructed by the Engineer, fill layers shall be bonded by benching into the existing face to depth at the face equal to the layer thickness. Layer thicknesses are restricted to 150mm after compaction with heavy compaction plant or to 100mm if smaller hand held compaction equipment is used.

(c)           Compaction requirements

All compaction for backfilling fill embankments shall be done to a density of not less than 90% of modified AASHTO density. Cut embankments need to be backfilled to a density of not less than 90% of modified AASHTO density. Any roadbed has to be compacted to 93% of modified AASHTO density.

(d)           Reconstruction of pavement layers at slope failures and washaways.

Unless otherwise instructed by the Engineer the pavement layers shall consist of:

- (i)           150mm thick natural gravel fill layers, as required, compacted as previously described,
- (ii)          One 150mm thick selected natural gravel subgrade layer, compacted to 93% modified AASHTO density,
- (iii)         Two 150mm thick cement stabilised natural gravel subbase layers, compacted to 95% modified AASHTO density,
- (iv)         One 150mm thick emulsion treated crushed stone base layer compacted to 100% modified AASHTO density,
- (v)         One 40mm thick continuously graded asphalt layer compacted to 94% of Marshall density.

The natural gravel subbase and crushed stone base materials shall be stabilised with cement at a rate of application of 60kg cement for each cubic metre of material.

The technique of rolling used in compaction of the asphalt surfacing shall be at the discretion of the Contractor provided that adequate roller coverage is applied to produce a dense layer which shall be substantially free of surface cracks and not deform under traffic.

(e)           Classification of excavations

All excavations shall be classified according to section M0200: General Requirements and Provisions.

M1703       ACCEPTANCE CRITERIA

The re-instatement of cut and fill slips and washaways shall require a standard of workmanship to produce repair work not liable to settle after re-construction.

At reconstructed fills the horizontal measurement taken from the centre line of the road to the side of the fill shall not at any point be less, or 250mm more than the dimensions instructed by the Engineer when measured at any level.

The edges of the completed surfacing layer shall not be above the existing surface by more than 3mm. The edges shall not be below the surrounding road surface.

The crossfall on the reconstructed surfacing layer shall be equal to that of the adjacent surface to within a tolerance of  $\pm 0.5\%$  crossfall.

When tested with a 3m straight edge laid parallel to or at right angles to the road centre line the surface of the area shall not deviate from the bottom of the straight edge by more than 10mm.

The thickness of the surfacing layer at any point shall not be less than 30mm or more than 50mm.

M1704 MATERIALS

- (a) Natural gravel material
- The Contractor shall only use material, which complies with the prescribed requirements in the relevant layers. Backfill and selected subgrade material shall be of G7 quality or better or as specified by the Engineer in writing.
- (b) Crushed stone base material
- Crushed stone base material as specified in section M1100: Pavement Layer Repairs.
- (c) Stabilised subbase material
- Stabilised materials as specified in section M1100: Pavement Layer Repairs
- (d) Tack coat
- Tack coat as specified in section M1100: Pavement Layer Repairs.
- (e) Asphalt surfacing layer
- Asphalt as specified in section M1100: Pavement Layer Repairs.

M1705 MEASUREMENT AND PAYMENT

The reinstatement work executed at the scene of incidence shall be paid for under this section.

Any slope protection or stability measures ordered by the Engineer shall be executed in accordance with the requirements of the sections covering the work and shall be paid for under the relevant pay items in those sections.

M1700 REPAIR OF SLOPE FAILURES AND WASHAWAYS

<u>Item</u>	<u>Unit</u>
M170.01 Reconstruction of slope failures and washaways - mass earth works	
(a) Excavation and removing excavated material to spoil or stockpile as directed by the Engineer, including haul over a free haul distance of 1,0km. A distinction shall be made between:	
(i) Soft material	cubic metre (m <sup>3</sup> )
(ii) Intermediate material	cubic metre (m <sup>3</sup> )
(iii) Hard and boulder class material	cubic metre (m <sup>3</sup> )
(b) Drying excavated material suitable for re-use	cubic metre (m <sup>3</sup> )
(c) Roadbed compaction to 90% of modified AASHTO density	cubic metre (m <sup>3</sup> )
(d) Backfill at excavated area in	
(i) Fill embankments to 90% of modified AASHTO density	cubic metre (m <sup>3</sup> )

- (ii) Cut embankments to 90% of modified AASHTO density including haul for a free haul distance of 1,0km. cubic metre (m<sup>3</sup>)

The unit of measurement is the cubic metre of material, which shall be measured as follows:

- Roadbed compaction and all backfill in accordance with the authorised dimensions of the fill or layer.
- Excavated material and material for drying will be measured in loose heaped dimensions after excavation.

The quantity measured shall be computed by the method of average end areas from levelled cross-sections prepared from the ground line after clearing and grubbing and the removal of topsoil and the completion of any preparatory roadbed treatment which may have been ordered by the Engineer, but prior to the construction.

The tendered rates for excavation shall include full compensation for all plant and hand labour to excavate all material as directed by the Engineer, finishing off the excavation as specified and removing the material to stockpile or spoil within a free haul distance of 1,0km. Stockpiles or spoil areas shall be finished off as directed by the Engineer without any additional payment.

The tendered rate for drying of material shall include full compensation for all plant necessary to spread, rip and mix the material until it has dried sufficiently for use as backfill.

The tendered rate will also have to include full compensation for finishing off the stockpile area, after the material has been removed, to its original condition and to the satisfaction of the Engineer.

The tendered rates for the roadbed compaction shall include full compensation for shaping, scarifying, mixing of in situ and imported material if required, and preparing and compacting the material as specified.

The tendered rates for backfill shall include full compensation for procuring, furnishing and placing the material, including excavating as if in soft excavation, for transporting the material for a free haul distance of 1,0km; for preparing, processing, shaping, watering, mixing and compacting the materials to the densities or in the manner specified herein and for removing and disposing of up to 5% oversize material from the road after processing, including transport for a free haul distance of 1,0km.

<u>Item</u>		<u>Unit</u>
M170.02	Reconstruction of pavement layers	
(a)	Natural gravel selected subgrade	cubic metre (m <sup>3</sup> )
(b)	Cement stabilised natural gravel subbase	cubic metre (m <sup>3</sup> )
(c)	Emulsion treated crushed stone base	cubic metre (m <sup>3</sup> )
(d)	Hot mix asphalt	ton (t)
(e)	Cold mix asphalt mixed on site	ton (t)
(f)	Cold mix asphalt from commercial sources	ton (t)

The unit of measurement shall be a cubic metre of selected subgrade material, cement stabilised natural gravel subbase, emulsion treated crushed stone base and ton for asphalt surfacing layer measured in place after compaction. The quantity will be computed in accordance with the authorised dimensions of each layer.

The tendered rate for cement stabilised natural gravel material shall include full compensation for procuring the material from the designated source and mixing it with the stabilising agent,

compacting the material, including haul over a free-haul distance of 1,0km. The tendered rate shall include for providing and applying the stabilising agent.

The tendered rate for emulsion treated crushed stone base material shall include full compensation for providing the material irrespective of its origin, for mixing all with the stabilising agents, placing, compacting and finishing as specified. The tendered rate shall include for providing and applying the stabilising agent.

The tendered rate for asphalt surfacing obtained from commercial sources shall include full compensation for supplying, transporting, spreading, compacting and finishing the layer in accordance with the specifications.

The tendered rate for asphalt surfacing mixed on site shall include full compensation for providing all materials, irrespective of origin for mixing the constituents, placing, compacting and finishing as specified.

<u>Item</u>	<u>Unit</u>
M170.03      Tack coats	
(a)          30% Stable grade emulsion	square metre (m <sup>2</sup> )

The unit of measurement for the tack coat applied shall be the square metre, measured in place.

The tendered rates shall include for the procuring, furnishing and applying the materials at the specified spray rates.

<u>Item</u>	<u>Unit</u>
M170.04      Overhaul on natural gravel material	cubic metre kilometre (m <sup>3</sup> -km)

The unit of measurement shall be the cubic metre of overhauled material, nett volume of material compacted in place hauled in excess of 1,0km, multiplied by the overhaul distance.

The tendered rate for overhaul shall include full compensation for hauling the material in excess of the free-haul distance.



**SERIES M2000 : DRAINAGE MAINTENANCE**

**SECTION M2100 : REPAIR AND MAINTENANCE OF INLET AND OUTLET STRUCTURES**

**CONTENTS**

M2101	SCOPE
M2102	EXECUTION OF WORK
M2103	ACCEPTANCE CRITERIA
M2104	MATERIALS
M2105	MEASUREMENT AND PAYMENT

**M2101 SCOPE**

This section covers the work in connection with, and where required, the maintenance and repairs of existing inlet and outlet structures.

**M2102 EXECUTION OF WORK**

The repairs to inlet and outlet structures shall be carried out where directed by the Engineer.

Repairs to existing inlet and outlet structures may involve the complete or partial demolition of these structures and the reconstruction or repair thereof as instructed by the Engineer.

**(a) Excavation**

The size of excavation shall be the neat outside dimension of the structure, plus an allowance of 0.5m of working space around the structure.

Where unstable material is encountered below the founding level of the concrete floor slab of the structure it shall be removed to a depth ordered by the Engineer. Unsuitable material removed shall be replaced with gravel or other approved material compacted to the density at which the penetration is measured by a DCP not exceeding 10mm per blow.

**(b) Classification of excavation**

All excavations for inlet and outlet structures shall be classified for payment purposes as follows:

**Hard material:** Material that cannot be excavated except by drilling and blasting or with the use of pneumatic tools or mechanical breakers.

**Soft material:** All material not classified as hard material shall be classified as soft material.

Notwithstanding the above classification, all material excavated from existing fills and pavement layers shall be classified as soft material.

**(c) Disposal of excavated material**

All excavated material not suitable for backfilling material shall be removed and disposed of where directed by the Engineer.

Material suitable for use in the works, however, shall be used as ordered.

(d) Removal of damaged structures

Damaged inlet and outlet structures shall be demolished as ordered by the Engineer and the material removed to spoil where directed.

(e) Repairing of existing inlet and outlet structures

Where fresh concrete is cast against old concrete, the contact surface shall be roughened and cleaned of all dirt and loose particles. Fresh concrete shall be bonded to old concrete by applying durapox or approved equivalent epoxy resin slurry. If dowels are required, they shall be installed in holes drilled into the existing structure according to details shown on drawings or as instructed by the Engineer. Dowels shall be secured by means of an approved epoxy resin grout.

Where existing stone masonry head- and wing-walls are to be repaired, it is the intention to again make use of stone masonry construction. If suitable rock is not available from areas next to the road, commercial rock may be ordered as allowed in the Schedule of Quantities.

(f) Backfilling to inlet and outlet structures

The backfill material shall be material selected from the excavation, mixed with 80kg Portland cement for every cubic metre of material.

Generally the backfill material shall be sandy material, but may contain larger particles up to 38mm and shall have a plasticity index not exceeding 12.

The soil cement shall be mixed on site with suitable concrete mixers and the water and cement content shall be carefully controlled. Hand mixing will not be permitted.

Material for backfilling alongside the structures shall be placed at optimum moisture content and compacted in layers not exceeding 150mm after compaction and when tested with a dynamic cone penetrometer the average penetration rate recorded at every 5 blows for each layer shall not exceed 50mm. The full depth of a layer shall be tested.

M2103 ACCEPTANCE CRITERIA

Inlet and outlet structures shall be repaired neatly to the dimensions specified.

Structural repair shall be in uniformity with the existing structure.

M2104 MATERIALS

(a) Concrete

Concrete for the various structural components shall comply with the class specified by the Engineer.

(b) Bricks

Bricks shall be engineering grade bricks conforming to the requirements of SABS227.

Brickwork shall be built in English bond with mortar consisting of one part cement and six part of sand or in stretcher bond where its wall thickness does not exceed 115mm.

(c) Plaster

Where the plastering of brickwork is required all joints shall be well raked out and the brick face thoroughly wetted before plastering is applied. Plaster shall consist of one part of cement to four parts of approved sand and shall be applied not less than 12mm or more than 20mm thick.

(d) Manhole covers, grid inlets, *inter alia*

Manhole covers and frames, grid inlets and other metal accessories shall be supplied and/or manufactured in accordance with the details shown on the drawings or as instructed by the Engineer.

(e) Stone masonry

Only durable rock fragments shall be used for the repair of existing stone masonry inlet and outlet structures. The rock fragments shall not exceed 300mm in diameter and shall not be smaller than 100mm in diameter. The mortar used to construct stone masonry walls shall consist of one part cement and six parts of sand.

M2105 MEASUREMENT AND PAYMENT

M2100 REPAIR AND MAINTENANCE OF INLET AND OUTLET STRUCTURES

<u>Item</u>	<u>Unit</u>
M210.01 Excavation	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of material excavated measured down from the existing ground profile to the depth ordered or as shown on the drawings. The outside dimensions for determining the volume of the excavation shall be the neat outside plan dimensions of the structure, plus an allowance of 0.5m of working space around the structure.

The tendered rate shall include full compensation for all excavation, temporary timbering, shoring and strutting for preparing the bottom of the excavation for the floor slab, the disposal of excavated material unsuitable for backfilling and keeping excavations safe.

The tendered rate shall include full compensation for transporting the excavated material for a free-haul distance of 1.0km.

<u>Item</u>	<u>Unit</u>
M210.02 Backfilling	
(a) Using the excavated material	cubic metre (m <sup>3</sup> )
(b) Using stabilised excavated material	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of material in place around the structure after compaction. The quantity shall be calculated from the leading dimensions of the backfilling as specified or as authorised by the Engineer. Backfilling to over excavation shall not be paid for.

The tendered rates shall include full compensation for backfilling under the floor slab where required alongside the structure, for watering, and backfill to the specified requirements. The tendered rates for stabilised backfill shall include full compensation for providing and mixing the stabilising agent with the natural material.

<u>Item</u>	<u>Unit</u>
M210.03 Reconstruction of inlet and outlet structures	
(a) In concrete (class indicated)	cubic metre (m <sup>3</sup> )
(b) In brickwork	cubic metre (m <sup>3</sup> )
(c) Plastering	square metre (m <sup>2</sup> )

The unit of measurement shall be the cubic metre of concrete constructed in place.

The unit of measurement for plastering shall be square metre of brickwork plastered.

The tendered rates shall include full compensation for procuring all material and all work necessary for constructing the structures to the authorised dimensions. In the case of concrete work the tendered rate shall include for providing and erecting the formwork and for benching the inverts.

<u>Item</u>	<u>Unit</u>
M210.04 Accessories	
(a) Provisional sum for the cost of accessories	Provisional sum (Prov Sum)
(b) The Contractor's overhead charges and profit in connection with providing the service	percentage (%)

The provisional sum items shall be paid for in accordance with the provision of the FIDIC General Conditions of Contract for Construction, 1999.

The tendered percentage for provisional sum items is a percentage of the amount actually spent, which shall include full compensation for the overhead costs of the Contractor, and the profit in connection with providing the service.

<u>Item</u>	<u>Unit</u>
M210.05 Demolition of existing structures	
(a) Plain concrete	cubic metre (m <sup>3</sup> )
(b) Reinforced concrete	cubic metre (m <sup>3</sup> )
(c) Brickwork	cubic metre (m <sup>3</sup> )
(d) Stone masonry	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of existing material removed.

The tendered rate shall include full compensation for demolishing and for loading, transporting and disposing of the material including a free-haul of 1.0km.

Payment shall distinguish between plain and reinforced concrete. For the purposes of this item, reinforced concrete shall be defined as concrete containing at least 0.2% of steel reinforcement measured by volume.

<u>Item</u>	<u>Unit</u>
M210.06 Repairing of existing structures (type indicated)	
(a) Concrete (class indicated)	cubic metre (m <sup>3</sup> )
(b) Bricks	cubic metre (m <sup>3</sup> )
(c) Stone masonry with rock material obtained from	
(i) Natural sources	cubic metre (m <sup>3</sup> )
(ii) Commercial sources	cubic metre (m <sup>3</sup> )

(d)	Plastering	square metre (m <sup>2</sup> )
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The unit of measurement shall be the cubic metre of concrete, bricks or stone masonry used in place for repairs, with distinction being made in the source for obtaining rock material.

The unit of measurement for plastering shall be the square metre of brickwork plastered.

The tendered rate shall include full compensation for procuring all material and for all work necessary for reinstating demolished sections to the authorised dimensions. In the case of concrete work the tendered rate shall include for providing and erecting formwork, the preparation and treatment of surfaces as specified for joining old and new concrete as well as the installation of dowels as specified.

<u>Item</u>		<u>Unit</u>
M210.07	Steel reinforcement	
(a)	Mild steel bars	ton (t)
(b)	High tensile steel bars	ton (t)
(c)	Welded steel mesh	kilogram (kg)

The unit of measurement for steel bars shall be the ton of reinforcing, and kilogram of welded steel mesh in place in accordance with the drawings or as authorised. Ties, stools and other steel used for positioning the reinforcing steel shall be measured as steel reinforcement.

The tendered rate shall include full compensation for supplying, delivering, cutting, bending, welding, trial weld joints, placing and fixing the steel reinforcement including all tying wire, spacers and waste.

<u>Item</u>			<u>Unit</u>
M210.08	Overhaul on materials for haul in excess of 1.0km		
(a)	Excavated material to spoilcubic	metre	kilometre (m <sup>3</sup> -km)
(b)	Existing structures demolishedcubic	metre	kilometre (m <sup>3</sup> -km)

The unit of measurement shall be the cubic metre of material hauled in excess of 1,0km, volume of material measured loose in truck in the case of excavated material transported to spoil and in the case of demolished material the actual volume of material demolished in place measured before demolition, all multiplied by the overhaul distance.

The tendered rate shall include full compensation for hauling the material in excess of the free-haul distance.

**SERIES M2000 : DRAINAGE MAINTENANCE**

**SECTION M2200 : SUBSOIL DRAIN INSTALLATION AND MAINTENANCE**

**CONTENTS**

M2201	SCOPE
M2202	EXECUTION OF WORK
M2203	ACCEPTANCE CRITERIA
M2204	MATERIALS
M2205	MEASUREMENT AND PAYMENT

**M2201 SCOPE**

This section covers the work in connection with the construction of subsoil drainage on existing roads and the reinstatement of damaged and maintenance of existing subsoil drains.

**M2202 EXECUTION OF WORK**

Subsoil drains shall be constructed where directed by the Engineer. The subsoil drainage system or systems to be installed shall be as prescribed in the Project Specifications or as directed by the Engineer.

**(a) Excavation**

Trenches for subsoil drainage systems shall be excavated to the dimensions and gradients shown on the drawings or as directed by the Engineer.

**(b) Classification of excavation**

All excavations for subsoil drains shall be classified for payment purposes as follows:

Hard material: Material that cannot be excavated except by drilling and blasting or with the use of pneumatic tools or mechanical breakers.

Soft material: All material not classified as hard material shall be classified as soft material.

Notwithstanding the above classification, all material excavated from previously constructed fill and pavement layers shall be classified as soft material.

**(c) Disposal of excavated material**

All excavated material, except that quantity required for the impermeable backfill layer, shall be completely removed from the site and disposed of to an approved spoil site or where directed by the Engineer.

**(d) Exposing existing subsoil pipes**

Where instructed existing subsoil pipes shall be exposed for inspection.

The material on top of the pipe shall be carefully removed by hand. Care shall be taken not to damage the filter fabric and pipe during excavation.

Repair work, if required, shall be carried out as directed by the Engineer. It may involve the replacement of the existing pipe and the backfill with material similar to that encountered in the existing system.

(e) Installation of subsoil drains

The subsoil drainage system or systems to be constructed shall be as shown on the drawings.

The following systems may be applicable depending on the conditions on site:

(i) With natural permeable material

A layer of natural permeable material of specified grade and thickness required shall be placed on the bottom of the trench and be lightly tamped and finished to the required gradient.

Pipes of the type and size required shall then be firmly bedded on the permeable layer. Thereafter, the trench shall be backfilled with natural permeable materials to such height above the pipes as required. The permeable material shall be lightly compacted and trimmed to the required level. The remainder of the trench shall be backfilled with approved impermeable material in layers not exceeding 100mm and compacted to at least the same density as the surrounding material.

(ii) With polyethylene lining to trenches

Where directed by the Engineer, trenches shall be lined with approved polyethylene sheeting. The polyethylene sheet shall cover the bottom of the trench and shall extend upwards on both sides for as far as may be directed by the Engineer in each particular case, in order to form a waterproof channel. At joints the sheeting shall be lapped by a minimum of 200mm.

The trench shall be backfilled as described in system (i) but care shall be taken not to displace or damage the sheeting in any way.

(iii) With synthetic-fibre filter fabric

Where specified that synthetic-fibre filter fabric shall be used for lining in subsoil drains it shall be installed as shown on the drawings. The lining shall not be displaced or damaged in any way when the trench is being backfilled.

(iv) With composite in-place drainage fabric

Where required, composite in-place drainage system shall be constructed in accordance with the details shown on the drawings. The elements of the system shall be assembled above ground in manageable lengths, and all exposed surfaces shall be sealed with an approved geofabric seal. The system shall be installed against the side through which the subsoil flow is expected. The trench shall then be backfilled with approved sand, which shall be saturated with water after placement, up to the prescribed level. Where instructed the upper part of the trench shall be backfilled with impermeable material, which shall be compacted to the density of the surrounding material, in layers not exceeding 100mm thickness.

(f) Draining of distressed areas

Where the presence of subsurface water has caused failures of the pavement layers the Engineer may require the installation of subsoil drains through the road to drain the excavation before re-instatement of the pavement layers.

The subsoil drainage system to be installed shall be as instructed by the Engineer.

Where asphalt premix is to be removed for the installation of a subsoil drain the asphalt shall be cut neatly and vertically with approved sawing equipment to the lines ordered by the Engineer before excavation.

Payment for the excavation of asphalt premix layers and the reconstruction of the pavement layers shall be made under section M1100: Pavement Layer Repairs. The excavation of single and double seal surfacing layers shall not be classified as removal of asphalt surfacing and shall be paid for as soft excavation under the relevant items in this section.

(g) Rodding eyes and outlet structures

Rodding eyes shall be constructed in accordance with the details shown on the drawings or as instructed by the Engineer and be provided at the upstream end of each section of subsoil drain.

Concrete outlet structures for subsoil drains shall be constructed in accordance with the details specified or as instructed by the Engineer.

Rodding eyes and outlet structures shall be marked with markers as detailed on the drawings.

(h) Maintenance of subsoil drains

When instructed by the Engineer, blocked subsoil drains shall be unblocked by rodding through rodding eyes provided for the purpose and thorough flushing of pipes.

Should the Contractor notice the existence of blocked or damaged subsoil drains, the Engineer shall be duly notified to enable him to issue an instruction for the execution of required maintenance work.

M2203 ACCEPTANCE CRITERIA

The subsoil drain constructed true to line, level and grade as directed.

The site where the drain was installed must be left neat and tidy and all surplus material transported to spoil.

Side drains damaged during subsoil installation shall be repaired and surplus material transported to spoil.

M2204 MATERIALS

(i) Pipes

Generally pipes shall have an internal diameter of not less than 100mm.

Pipes shall comply with the following requirements:

Perforated or slotted unplasticized PVC with SABS 791;

Perforated high-density polyethylene pressure pipes with SABS 533 Part II.

The size of perforations in perforated pipes shall in all cases be 8mm  $\pm$  1,5mm and spaced as shown on the drawings for the various sizes of pipes or as otherwise approved by the Engineer.

The size of slots and arrangement of slots for slotted pipes shall be as shown on the drawings.

Unslotted or unperforated pipes shall be installed where directed by the Engineer.



- (ii) Natural permeable material
- Natural permeable filter materials shall consist of clean hard sand and/or crushed stone which shall comply with the requirements as specified in the Project Specifications.
- (iii) Polyethylene sheeting.
- Polyethylene sheeting shall be 0,25mm thick Type C sheet complying with SABS 952/1985.
- (iv) Synthetic-fibre filter fabric
- Filter fabric shall not be exposed to direct sunlight for prolonged periods and shall be protected from mechanical damage during installation and construction.
- (v) Composite in-place draining fabric
- The make and class of fabric shall comply with the requirements of the project specifications and the drawings.

## M2205 MEASUREMENT AND PAYMENT

### M2200 SUBSOIL DRAIN INSTALLATION AND MAINTENANCE

<u>Item</u>		<u>Unit</u>
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#### M220.01 Excavation

- |     |                          |                               |
|-----|--------------------------|-------------------------------|
| (a) | Excavating soft material | cubic metre (m <sup>3</sup> ) |
| (b) | Excavating hard material | cubic metre (m <sup>3</sup> ) |

The unit of measurement shall be the cubic metre of material excavated in accordance with the authorised dimensions measured in place.

The tendered rates shall include full compensation for the excavation of the material to the required lines, levels and grades and the disposal of the material as directed, including a free-haul of 1,0km.

<u>Item</u>		<u>Unit</u>
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#### M220.02 Impermeable backfilling cubic metre (m<sup>3</sup>)

The unit of measurement shall be the cubic metre of completed backfill measured in place and calculated in accordance with the authorised dimensions. Selected material from the excavation shall be used as approved by the Engineer.

The tendered rate shall include full compensation for selecting, placing and compacting the backfilling.

<u>Item</u>		<u>Unit</u>
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#### M220.03 Natural permeable material

- |     |  |                               |
|-----|--|-------------------------------|
| (a) | Crushed stone from commercial source (state grade)       | cubic metre (m <sup>3</sup> ) |
| (b) | Sand obtained from approved source on site (state grade) | cubic metre (m <sup>3</sup> ) |
| (c) | Sand from commercial source (state grade)                | cubic metre (m <sup>3</sup> ) |

The unit of measurement shall be the cubic metre of approved stone and sand in place in the drains calculated in accordance with the authorised dimensions.

The tendered rate shall include full compensation for procuring and furnishing approved material irrespective of its origin and placing the material as specified.

For payment purposes a distinction shall be made between the different grades of sand and crushed stone.

<u>Item</u>	<u>Unit</u>
M220.04      Pipes	
(a)            Unplasticized PVC pipes and fittings, normal duty, complete with couplings (State size and whether or not perforated or slotted)	metre (m)
(b)            High density type polyethylene pressure pipes and fittings, complete with couplings (State size, type and class and whether or not perforated)	metre (m)

The unit of measurement shall be the metre of pipe, measured in place along its centre line, including the length of fittings.

The tendered rate shall include full compensation for procuring, furnishing, laying and jointing the pipes and fittings as specified.

<u>Item</u>	<u>Unit</u>
M220.05      Polyethylene sheeting 0,25mm thick	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of sheeting installed measured net from the specified dimensions.

The tendered rate shall include full compensation for procuring, supplying, cutting, overlapping, placing and protecting the sheeting as well as for wastage.

<u>Item</u>	<u>Unit</u>
M220.06      Synthetic fibre filter fabric (describe type and grade, inter alia)	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of filter fabric installed as specified.

The tendered rate shall include full compensation for procuring, furnishing, cutting, overlapping, jointing, placing and protecting the fabric as well as for wastage.

<u>Item</u>	<u>Unit</u>
M220.07      Composite in-place drainage systems (State type, size and grade, inter alia)	metre (m)

The unit of measurement shall be the metre of composite in-place drainage system measured in place along the centre line of the system.

The tendered rate shall include full compensation for procuring, furnishing, assembling, installing and jointing the system complete, as specified, but excluding the length of pipe installed.

<u>Item</u>	<u>Unit</u>
M220.08      Inlet and outlet structures	
(a)      Rodding eyes	number (No)
(b)      Outlet structures	number (No)

The unit of measurement shall be the number of structures constructed in place.

The tendered rate shall include full compensation for procuring and furnishing all materials, for providing and erecting formwork and constructing the units including the provision and erecting of markers.

<u>Item</u>	<u>Unit</u>
M220.09      Exposing of existing drains	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of material removed by hand to expose the drain.

The rate tendered shall include full compensation for all labour and tools required for removing the material. The re-instatement of the drain shall be paid for under the relevant items for constructing a new drain.

<u>Item</u>	<u>Unit</u>
M220.10      Clearing of subsoil drains	metre (m)

The unit of measurement shall be metre of drain cleared on the instruction of the Engineer.

The tendered rate shall include full compensation for all labour equipment, tools and transport required for clearing subsoil drains and for disposal of the cleared material at approved sites.

<u>Item</u>	<u>Unit</u>
M220.11      Overhaul for material hauled in excess of 1,0km free-haul	
(a)      Spoil material	cubic metre-kilometre (m <sup>3</sup> -km)

The unit of measurement shall be the cubic metre of material hauled in excess of 1,0km, the volume determined from the rated capacity of the truck multiplied by the overhaul distance. All trucks shall be fully loaded to their rated capacity.

The tendered rate shall include full compensation for hauling the material in excess of the free-haul distance.

**SERIES M2000 : DRAINAGE MAINTENANCE**

**SECTION M2300 : CLEANING OF WATERWAY STRUCTURES**

**CONTENTS**

M2301	SCOPE
M2302	EXECUTION OF WORK
M2303	ACCEPTANCE CRITERIA
M2304	MEASUREMENT AND PAYMENT

**M2301 SCOPE**

This section covers the work in connection with the clearing and transporting to spoil of obstructions restricting the flow of water through waterway structures.

A structure is classified as a waterway structure when the inlet area of the structure is greater than 5m<sup>2</sup>.

**M2302 EXECUTION OF WORK**

Obstructions shall be removed when instructed by the Engineer and the Contractor shall dispose of all material at designated spoil sites approved by the Engineer.

Obstruction to flow is generally caused by the building up of debris and vegetation against abutments and piers of structures and silting of inverts.

In certain circumstances accesses for moving equipment to and from the site may be required. The Contractor shall be paid for executing work necessary to construct accesses to the requirements of the Engineer, under the relevant sections in the specification.

When instructed by the Engineer vegetation and debris removed shall be cut to size for transporting purposes. All vehicles used for transporting the material to spoil shall be fully loaded with the material removed prior to leaving the site.

**M2303 ACCEPTANCE CRITERIA**

The waterway shall be cleared of all debris, vegetation and silt.

The site shall be left neat and tidy and any temporary accesses constructed shall be treated as directed by the Engineer.

**M2304 MEASUREMENT AND PAYMENT**

The work executed under this section shall be paid for on a dayworks basis under the hourly rates in the daywork schedule.

**SERIES M2000 : DRAINAGE MAINTENANCE**

**SECTION M2400 : CLEANING OF PREFABRICATED CULVERTS**

**CONTENTS**

M2401	SCOPE
M2402	EXECUTION OF WORK
M2403	ACCEPTANCE CRITERIA
M2404	INSPECTION OF PREFABRICATED CULVERTS FOR PAYMENT
M2405	MEASUREMENT AND PAYMENT

**M2401 SCOPE**

This section covers the cleaning of prefabricated culverts. The work involved under this section is the removal of silt and debris from the prefabricated culverts and the removal and clearing of vegetation, silt and debris from the inlet and outlet areas as shown on the drawing.

**M2402 EXECUTION OF WORK**

All prefabricated culverts, inlet and outlet areas up to the end of the road reserve as shown on the drawing shall be cleaned initially within the first two months of the contract period and kept clean thereafter.

Material removed shall be disposed of in close proximity of the culverts within the road reserve or loaded and transported to spoil at dumping areas approved by the Engineer.

Material spoiled near the culverts shall be spread neatly well clear of the top of drainage trenches where it cannot wash back.

**M2403 ACCEPTANCE CRITERIA**

Cleaning of prefabricated culverts

The culverts, inlet and outlet areas shall be kept clean, not allowing more than 20% of vertical height to be filled with silt or debris at any position of the culvert or at the inlet and outlet areas of the culvert.

**M2404 INSPECTION OF PREFABRICATED CULVERTS FOR PAYMENT**

Cleaning of prefabricated culverts

Inspection for the cleaning will be based on the following:

- Inspection of the prefabricated culverts will be monthly.
- The road will be broken up in 1km sections for inspections.
- The total length of road shall be divided by 20 to determine the number of sections to be inspected. A maximum number of 10 sections and a minimum of 4 shall be inspected and the positions will be chosen randomly. (The same sections of road will apply for section M2500 & M2700).
- If one prefabricated culvert in a 1km section of road does not comply with the acceptance criteria, that section fails.
- There will be no inspection for 3 days after it has rained in the catchment area of the section of road identified for inspection.

- The Contractor will be penalised by the number of failed sections multiplied by the penalty amount as specified in the Project Specifications for not complying with the specifications.

M2405 MEASUREMENT AND PAYMENT

M2400 CLEANING OF PREFABRICATED CULVERTS

<u>Item</u>	<u>Unit</u>
M240.01	month
Cleaning of prefabricated culverts, inlet and outlet areas The tendered rate per month shall include full compensation for removing the material and vegetation from the culverts, inlet and outlet areas for loading the material onto trucks, for transporting the material and spoiling the material as specified. Overhaul must be included in the rate and there will be no extra payment for overhaul in excess of the free haul distance.	

**SERIES M2000 : DRAINAGE MAINTENANCE**

**SECTION M2500 : CLEANING OF CONCRETE DRAINS AND CHANNELS**

**CONTENTS**

M2501	SCOPE
M2502	EXECUTION OF WORK
M2503	ACCEPTANCE CRITERIA
M2504	INSPECTION OF CONCRETE DRAINS AND CHANNELS FOR PAYMENT
M2505	MEASUREMENT AND PAYMENT

**M2501 SCOPE**

This section covers the work in connection with the removal of silt, debris and vegetation causing obstruction to flow in concrete drainage channels, *inter alia*, side drains, median drains, kerb-channelling combinations, down chutes and any other concrete drains or concrete channels and armco/plastic chutes,.

**M2502 EXECUTION OF WORK**

Silt and debris at grid inlets and concrete channel outlets shall be removed once a week during the rainy season and twice a month thereafter or as instructed by the Engineer.

Material removed from channels shall either be loaded and transported to designated spoil sites or disposed of adjacent to channels where it cannot wash back into the channel within the road reserve as approved by the Engineer.

Where material is spoiled adjacent to channels the Contractor shall ensure that the material is spread neatly and well clear of the top of the channels where it cannot wash back. Material removed from kerb and channel combinations, side drains in cuts and median drains or from other channels where directed by the Engineer shall be transported to spoil.

Vegetation growing in channel joints and cracks shall be removed with roots to prevent re-growth.

Vegetation growing over channels from the edges shall be slashed at the concrete edges and disposed of. Undesirable vegetation shall be removed with roots and spoiled where directed by the Engineer.

Silt debris and vegetation removed shall not be thrown up against cut or down fill slopes.

**M2503 ACCEPTANCE CRITERIA**

Cleaning of concrete drainage channels and grid inlets.

All side drains, median drains, kerb-channelling combinations, down chutes and any other concrete drains or concrete channels shall be kept clean, allowing at least 90% of the design waterway capacity to be available.

The vegetation growing over channels from the edges shall not be more than 5% of the area of the channels.

**M2504 INSPECTION OF CONCRETE DRAINS AND CHANNELS FOR PAYMENT**

Cleaning of concrete drainage channels

Inspection for the cleaning of concrete drainage channels will be based on the following:

- Inspection of the concrete drains and channels will be monthly.
- The road will be broken up in 1km sections for inspection.
- The total length of road shall be divided by 20 to determine the number of sections to be inspected. A maximum number of 10 sections and a minimum of 4 shall be inspected and the positions will be chosen randomly. (The same sections of road will apply for section M2400 & M2700).
- If more than 3 positions are identified that do not comply with the acceptance criteria, that section fails.
- There will be no inspection for 3 days after it has rained in the catchment area of the section of road identified for inspection.
- The Contractor will be penalised by the number of failed sections multiplied by the penalty amount as specified in the Project Specifications.

## M2505 MEASUREMENT AND PAYMENT

### M2500 CLEANING OF CONCRETE DRAINS AND CHANNELS

<u>Item</u>	<u>Unit</u>
M250.01     Cleaning of concrete drainage channels	month

The tendered rate is per month and shall include full compensation for all labour and equipment required for removing the material from channels irrespective of the depth of silt and debris and for loading, off-loading and spreading when material removed is intended for spoiling at approved spoil sites.

The tendered rates shall also include for transporting the excavated material to approved spoil sites in excess of the free haul distance.

Where material is disposed of adjacent to the channels, the tendered rate shall include full compensation for removing the material from the channels, irrespective of the depth of silt and debris, spoiling and spreading the material adjacent to the channel where it cannot be washed back into the channel.

<u>Item</u>	<u>Unit</u>
M250.02     Extra over for sweeping of concrete drainage channels	month

The tendered rate is per month and shall include full compensation for all labour and equipment required for removing the material from channels irrespective of the depth of silt and debris and for loading, off-loading and spreading when material removed is intended for spoiling at approved spoil sites.

The tendered rates shall also include for transporting the excavated material to approved spoil sites in excess of the free haul distance.

Where material is disposed of adjacent to the channels, the tendered rate shall include full compensation for removing the material from the channels, irrespective of the depth of silt and debris, spoiling and spreading the material adjacent to the channel where it cannot be washed back into the channel.



**SERIES M2000 : DRAINAGE MAINTENANCE**

**SECTION M2600 : CLEANING AND MAINTENANCE OF EXISTING EARTH CHANNELS**

**CONTENTS**

M2601	SCOPE
M2602	EXECUTION OF WORK
M2603	ACCEPTANCE CRITERIA
M2604	MEASUREMENT AND PAYMENT

**M2601 SCOPE**

This section covers the work involved in cleaning of all earth drains and channels, repairs to damaged earth drains and channels as well as construction and repairs of banks and dykes.

**M2602 EXECUTION OF WORK**

**(a) Drains**

Earth side drains and channels shall be cleaned of all debris, silt and vegetation when specified in the Project Specifications or when instructed by the Engineer.

Silt and debris excavated from the drains shall be deposited and spread neatly in close proximity of the drains where it will not wash back. Materials removed from drains shall not be deposited against cut and fill slopes.

Scoured and eroded sections of drains shall be backfilled with suitable material obtained from the side of the road or from suitable sources indicated by the Engineer. The backfill material shall be compacted at the optimum uniform moisture content in layers not exceeding 100mm after compaction. The material shall be compacted to the density at which the penetration as measured by a DCP does not exceed 10mm per blow.

If in the opinion of the Engineer drains require protective covering against scouring and erosion, such work shall be executed in accordance with the relevant section in this specification.

**(b) Construction and repair of banks and dykes**

Materials for the construction and repair of banks and dykes shall be an approved soil or gravel obtained from sources approved by the Engineer. It shall be positioned in such a way that water will flow on the natural ground and against the bank.

Banks and dykes shall be properly compacted in layers not exceeding 150mm in thickness. If so approved by the Engineer, mitre banks may also be constructed of hand-packed stone, provided that the interstices are filled with an approved cohesive soil.

**M2603 ACCEPTANCE CRITERIA**

Drainage channels shall be clear of any obstructions and no scouring, erosion or ponding evident.

Existing batter slopes and invert grades of drains shall be maintained.

## M2600 CLEANING AND MAINTENANCE OF EXISTING EARTH CHANNELS

The unit of measurement shall be the cubic metre of material cleaned out of the drain.

The unit of measurement shall be the cubic metre of compacted material calculated from the dimensions measured in place.

The unit of measurement shall be cubic metre of material in place in banks or dykes, calculated in accordance with authorised dimensions.

The unit of measurement shall be the cubic metre material hauled in excess of 1,0km. For imported material the net volume material compacted in place, multiplied by the average overhaul distance in excess of 1,0km and in the case for material to spoil, the volume of material measured loose in the truck multiplied by the average overhaul distance in excess of 1,0km.

The tendered rate shall include full compensation for hauling the material the distance from the designated source in excess of 1,0km

**SERIES M2000 : DRAINAGE MAINTENANCE**

**SECTION M2700 : EDGE BUILD-UP REMOVAL**

**CONTENTS**

M2701	SCOPE
M2702	EXECUTION OF WORK
M2703	ACCEPTANCE CRITERIA
M2704	INSPECTION OF EDGE BUILD-UPS FOR PAYMENT
M2705	MEASUREMENT AND PAYMENT

**M2701 SCOPE**

This section covers the work necessary for the removal of shoulder edge build-ups.

**M2702 EXECUTION OF WORK**

Material that has formed on edges of shoulders, including silt and grass growing on the road surface, restricting the free flow of water off the pavement, concentrating the water or presenting a potential hazard to traffic shall be removed. Material removed shall either be loaded and transported to designated spoil sites or disposed of adjacent to the road on the lower side of the road within the road reserve as approved by the Engineer.

Where the material is spoiled adjacent to the road the Contractor shall ensure that the material is spread neatly and well clear of the road where it cannot wash back.

**M2703 ACCEPTANCE CRITERIA**

All material higher than the road surface which restricts the free flow of water off the pavement must be removed not allowing a cumulative length of more than 10m of edge build-up in any 1km length of road inspected. Material resulting from the removal of edge build-ups shall be removed completely.

**M2704 INSPECTION OF EDGE BUILD-UP FOR PAYMENT**

Inspection for edge build-up will be based on the following:

- Inspection of the edge build-ups will be monthly.
- The road will be broken up in 1km sections for inspection.
- The total length of road shall be divided by 20 to determine the number of sections to be inspected. A maximum number of 10 sections and a minimum of 4 shall be inspected and the positions will be chosen randomly. (The same sections of road will apply for section M2400 & M2500).
- If any section does not comply with the acceptance criteria, that section fails.
- The Contractor will be penalised by the number of failed sections multiplied by the penalty amount as specified in the Project Specification.

**M2705 MEASUREMENT AND PAYMENT**

<u>Item</u>	<u>Unit</u>
M270.01 Removal of edge build-ups	month
The monthly rate shall include full compensation for all overheads, labour, tools, equipment, loading, transporting to approved spoil areas, off-loading and spreading the material for the execution of the work.	

**SERIES M2000 : DRAINAGE MAINTENANCE**

**SECTION M2800 : CONCRETE CHANNEL CONSTRUCTION AND MAINTENANCE OF EXISTING CHANNELS**

**CONTENTS**

M2801	SCOPE
M2802	EXECUTION OF WORK
M2803	ACCEPTANCE CRITERIA
M2804	MATERIALS
M2805	MEASUREMENT AND PAYMENT

**M2801 SCOPE**

This section covers the construction of new concrete lined drains where required and the maintenance of existing concrete drains. It includes the construction of kerb and channel combinations and repairs where required.

**M2802 EXECUTION OF WORK**

The Engineer will indicate the locations where new drains are to be constructed to improve drainage and shall instruct where repairs to existing drains are to be carried out.

Construction of the following type of concrete drains may be required:

- Concrete lining to open drains.
- Concrete chutes.
- Kerb-channel combination.

Concrete drains shall be constructed in accordance with the details shown on the drawings or as directed by the Engineer.

**(a) Excavation and preparation of bedding**

The excavations shall be neatly trimmed to lines and levels so as to permit the accurate construction of the concrete linings. All loose material shall be well rammed at the optimum moisture content for the material used.

Where excavations are in hard material, overbreak shall be backfilled with concrete of the same class as specified for the lining. Hard material shall be classified as material that can only be removed by pneumatic tools, mechanical breakers or by drilling and blasting.

In the case of kerbs and channels the trenches shall be excavated to the required depths and the bedding material shall be well rammed before placing the concrete.

**(b) Concrete linings**

Concrete lining of open drains shall be cast in situ only and the exposed surfaces shall be given a class U2 (wood floated) surface finish.

Sealed joints in concrete shall be in accordance with the details indicated on the drawings and joints shall be painted with a coat of approved bituminous emulsion containing 60% of residual bitumen by mass.

Expansion joints shall be made in accordance with the drawings.

(c) Chutes

Cast in situ chutes on cut and fill slopes shall be constructed in accordance with the drawings.

Where the material being excavated cannot be accurately trimmed, the Engineer may order that a concrete screed first be cast accurately to the underside of the chute. The sides shall extend above the surface of the slope and the outer faces of the sides shall be cast against formwork.

(d) Kerb-channel combination

Precast kerbing and channelling shall comply with the requirements of SABS 927. Cast in situ channelling shall be of the class indicated.

Kerbing and channelling shall be laid on the approved bedding with close joints filled with 3:1 sand: cement mortar not exceeding 10mm in thickness and neatly pointed with a pointing trowel. Kerbing shall be backed with in situ concrete in accordance with the details on the drawings.

(e) Concrete cast against existing surfaced edges

Where concrete lining or concrete channelling in kerb and channel combinations is to be cast against existing surfacing the edge shall first be cut, before excavation, with approved sawing equipment to provide a neat straight edge. Care shall be taken during the placing of the concrete not to spill concrete onto the adjacent surfacing. The Contractor, at own expense, shall remove any concrete stains.

(f) Reinstatement of damaged existing structures

Damaged existing structures shall be demolished to the extent ordered by the Engineer on site and the resulting debris shall be spoiled at designated sites.

The reinstatement of damaged sections shall be carried out to the same standards prescribed for new construction and shall be paid for under the relevant items scheduled for new structures.

Provision shall be made for the reinstatement of existing damaged prefabricated concrete chutes.

(g) Inlet and outlet structures

The structures shall be constructed in accordance with the requirements specified in the relevant section in this specification.

M2803 ACCEPTANCE CRITERIA

The drains shall be constructed neatly to the dimensions shown on the drawings and within the specified dimensional and alignment tolerances.

Repairs to drains shall be in uniformity with the existing structure.

M2804 MATERIALS

(a) Concrete

Concrete for the various structural components shall comply with the class detailed on the drawings.

- (b) Steel reinforcement
- (i) Steel bars
- Steel reinforcing bars shall comply with the requirements of SABS 920.
- (ii) Welded steel mesh
- Welded steel mesh shall comply with the requirements of SABS 1024.

M2805 MEASUREMENT AND PAYMENT

M2800 CONCRETE CHANNEL CONSTRUCTION AND MAINTENANCE OF EXISTING CHANNELS

<u>Item</u>	<u>Unit</u>
M280.01 Excavation	
(a) For open drains	
(i) Soft material	cubic metre (m <sup>3</sup> )
(ii) Hard material	cubic metre (m <sup>3</sup> )
(b) For chutes, kerb-channel combination	
(i) Soft material	cubic metre (m <sup>3</sup> )
(ii) Hard material	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of material excavated in accordance with the authorised dimensions measured in place.

The tendered rates shall include full compensation for all equipment, labour and tools necessary for excavating the material to the required dimensions, including trimming the excavation before placing concrete, disposing of the material as directed, including a free-haul of 1.0km.

<u>Item</u>	<u>Unit</u>
M280.02 Cast in situ concrete	
(a) Linings (class indicated)	cubic metre (m <sup>3</sup> )
(b) Chutes (class indicated)	cubic metre (m <sup>3</sup> )
(c) Channels for kerb and channel (Class indicated)	cubic metre (m <sup>3</sup> )
(d) Concrete berms	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of concrete placed in situ. The quantity shall be calculated in accordance with the authorised dimensions.

The tendered rates shall include full compensation for procuring and furnishing all material and for all work necessary for mixing, placing and finishing the concrete to the authorised dimensions, including providing and erecting of formwork, for sawing of asphalt layers and for providing expansion and contraction joints as included on drawings or as instructed by the Engineer.

It shall also include for excavating the upper pavement layer to accommodate the concrete bedding and to allow the kerb or channel to be placed to the correct level relative to that of the surfacing.

<u>Item</u>	<u>Unit</u>
M280.03      Concrete screed or backfill below chutes (class indicated)	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of concrete screed or backfill as may be instructed by the Engineer to be placed below chutes.

The tendered rate shall include full compensation for furnishing, procuring and placing the concrete in screed or backfill.

<u>Item</u>	<u>Unit</u>
M280.04      Precast concrete kerbing and chutes	
(a)          Kerbing (type indicated)	metre (m)
(b)          Chutes (type indicated)	metre (m)

The unit of measurement shall be the metre of precast kerbing and chute complete as constructed, measured along the face of the kerb.

The tendered rate shall include full compensation for preparing of bedding, furnishing and installing all materials and backing the kerb with in situ concrete, for backfilling behind kerbs, all complete as specified.

The rate shall also include for sawing asphalt layers.

<u>Item</u>	<u>Unit</u>
M280.05      Steel reinforcement	
(a)          Mild steel bars	ton (t)
(b)          High tensile steel bars	ton (t)
(c)          Welded steel mesh	kilogram (kg)

The unit of measurement for steel bars shall be the ton of reinforcing, and kilogram of welded steel in place in accordance with the drawings or as authorized. Ties, stools and other steel used for positioning the reinforcing steel shall be measured as steel reinforcement.

The tendered rate shall include full compensation for supplying, delivering, cutting, bending, welding, trial weld joints, placing and fixing the steel reinforcement including all tying wire, spacers and waste.

<u>Item</u>	<u>Unit</u>
M280.06      Sealed joints in concrete lining of open drains (type indicated with reference to drawings)	metre (m)

The unit of measurement shall be the metre of completed joint of each size and type.

The tendered rate shall include full compensation for supplying all material and for all labour, tools formwork and incidentals necessary for sealing the joint as shown on the drawings or specified in the Project Specifications.

<u>Item</u>		<u>Unit</u>
M280.07	Demolition and removal of damaged existing structures	
(a)	Plain concrete	cubic metre (m <sup>3</sup> )
(b)	Reinforced concrete	cubic metre (m <sup>3</sup> )
(c)	Kerbing and channelling	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of existing material demolished, determined from 70% of the rated cubic metre capacity of the truck used to remove the material.

The tendered rates shall include full compensation for all labour, equipment and tools for removal of the damaged sections, trimming the bedding and for loading, transporting and disposing of the material including a free-haul of 1.0km.

The reinstatement of damaged sections shall be paid for under the relevant items for constructing new structures.

<u>Item</u>		<u>Unit</u>
M280.08	Down chutes	
(a)	Corrugated steel (type and diameter specified)	metre (m)
(b)	Plastic (type and diameter specified)	metre (m)

The unit of measurement shall be the metre of completed chute as constructed, including any overlap, measured along the slope as laid but excluding transition sections and inlet and outlet structures measured separately, if required.

The tendered rate per metre shall include full compensation for procuring, furnishing and installing the completed chutes as specified and for all excavation and the preparation of bedding, backfilling, formwork and finishing required.

<u>Item</u>		<u>Unit</u>
M280.09	Overhaul on material for haul in excess of 1.0km	
(a)	Excavated material to spoil	cubic metre kilometre (m <sup>3</sup> -km)
(b)	Existing structures demolished	cubic metre kilometre (m <sup>3</sup> -km)

The unit of measurement shall be the cubic metre of loose material hauled in excess of 1.0km, measured according to the rated capacity of the truck used, multiplied by the average overhaul distance.

The tendered rate shall include full compensation for hauling the material in excess of the free-haul distance.



**SERIES M3000 : ROADSIDE MAINTENANCE**

**SECTION M3100 : FENCING**

**CONTENTS**

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**M3101 SCOPE**

This section covers the repair, maintenance and moving of existing fences where necessary and the erection of new fences along the boundaries of the road reserve where required.

**M3102 EXECUTION OF WORK**

Any fencing work identified either by the Contractor or during inspection by the Engineer shall be carried out on the instruction of the Engineer.

Any fencing defect creating an immediate hazard to the road user shall be attended to by the Contractor immediately after verbal approval by the Engineer. Any such emergency repair work shall be followed by a written instruction from the Engineer within 48 hours.

The Contractor shall ensure that the necessary materials, skilled personnel, tools and equipment are available at all times to maintain the road reserve fencing in a state of good repair.

The Engineer shall indicate where existing fences are to be moved to new locations, where new fences are to be erected, or where other repairs are necessary.

Unless otherwise instructed by the Engineer, where fences are to be repaired similar type fencing material to that in the existing fence line shall be used.

**(a) Clearing the fence line**

The fence line shall be cleared over a width of at least 1m on each side of the centre line of the fence and surface irregularities shall be levelled so that the fence will follow the general contour of the ground. Clearing shall include the removal of all trees, shrubs, stumps, isolated loose boulders or stone and other obstructions, which will interfere with proper construction of the fence. The bottom of the fence shall be located at a uniform distance above the ground line. All material removed shall be disposed of at designated spoil sites.

Any areas outside the road reserve where clearing is not permitted by the owner or is not practicable shall not be cleared if so directed by the Engineer.

**(b) Installation of posts and standards**

Straining posts shall be erected at all ends, corners and where changing direction in the line of fences and at all junctions with other fences. Straining posts shall not be spaced further apart than shown on the drawings or ordered by the Engineer. The

length of posts above ground shall be such that the correct clearance between the lowest wire and the ground can be obtained.

Posts shall be accurately set in holes and be provided with concrete bases to the dimensions specified.

Holes shall be dug to the full specified depth of the posts. Where due to the presence of rock the holes cannot be excavated by means of hand or pneumatic tools and the Contractor has to resort to the use of explosives, the Contractor shall be paid separately for the drilling and blasting operations required.

Corner, gate, end and straining posts shall be braced by means of stays or anchors as shown on the drawings or as directed by the Engineer. Pipe stays shall be bolted to the posts. Gateposts shall not be used as straining posts but at each gatepost a straining post shall be placed and stayed as specified.

Standards shall be firmly planted into the ground at the spacing as shown on the drawings or ordered by the Engineer. The spacing of standards between any two straining posts shall be uniform. In rock or hard materials, standards shall be either driven or set in holes drilled into the rock. The size of drilled holes shall be such that a tight fit is obtained. Care shall be exercised when driving standards in order to prevent buckling or damaging them.

All posts and standards shall be accurately aligned and set plumb. Where veranda type security fencing is used, the posts shall be planted with the overhang on the roadside and perpendicular to the direction of the fence. After posts and standards have been firmly set in accordance with the foregoing requirements, the fence wire shall be attached thereto at the spacings specified or as directed by the Engineer.

(c) Erecting fence wires

All fencing wire shall be wired to the sides of standards or posts in order to prevent the wires from being displaced or becoming loose. The wire shall be carefully strained and hung without sag, and with true alignment, care being exercised not to strain the wire so tightly that it will break, or that end, corner, straining or gate posts will be pulled up, or that it will be easily damaged during veld fires.

Each strand of fencing wire shall be securely fastened in the correct position to each standard with soft galvanised binding wire. The binding wire for each horizontal fence wire shall pass through a hole or notch in the standard to prevent slipping of the fence wire in a vertical direction, while the ends of the wire shall be wound at least four times around the fencing wire to prevent it from moving in a horizontal direction.

At end, corner, straining and gate posts the fencing wire shall be securely wrapped twice around the posts and secured against slipping by tying the end tightly around the wire by means of at least six snug, tight twists.

In the case of high tensile wire, two long windings may first be made before the six tight twists, to prevent the wire from breaking at the first twist. When using smooth wire the loose end shall preferably be bent over and hooked into the notch between the fencing wire and the first winding.

Splices in the fencing wire shall be permitted if made in the following manner using a splice tool. The end of each wire at the splice shall be carried at least 75mm past the splice tool and wrapped snugly around the other wire for not less than six complete turns, the two separate wire ends being turned in opposite directions. After the splice tool is removed pulling the wire ends together shall close the space left by it in the splice wire. The unused ends of wire shall be cut close so as to leave a neat splice.

The gaps between gate posts and the adjacent straining posts shall be fenced off with short fencing wires.

Droppers shall be tied to each fence wire with soft galvanised tying wire in the required position as specified for standards, to prevent slipping in a vertical direction. The spacing of droppers between any two straining posts shall be uniform. Anchoring to structures shall be done as specified or directed by the Engineer.

(d) Erecting diamond mesh or wire netting

In the case of vermin-proof, pedestrian and security fences, or where indicated by the Engineer, wire netting or diamond mesh shall be stretched against the fence and properly bed to the fencing wire. The diamond mesh or wire netting shall be secured by means of soft binding wire at 1.2m centres along the top and bottom wires and at 3m centres along each of the other fencing wires unless otherwise specified.

In the case of vermin-proof fencing, vermin shall be prevented from creeping under the fence by either one of the two methods described below, as ordered by the Engineer:

- (i) By folding back the bottom 130mm of the wire netting so that it lies flat on the ground and packing stones (minimum dimension 200mm) end to end on this flap to secure it in position.
- (ii) By embedding the lower 130mm of the wire netting into the ground and thoroughly ramming the earth around it on both sides to secure the netting.

(e) Closing openings under fences

At ditches, streams, drainage channel or other hollows where, it is not possible to erect the fence so that it follows the general contour of the ground, the Contractor shall close the opening under the fence by means of horizontal barbed wires at a distance of 150mm from each other, stretched between additional posts or straining posts as specified or as directed by the Engineer. In the case of pedestrian, vermin-proof and security fences, the opening shall be covered with strips of wire netting or diamond mesh, 100mm wide, fixed to the barbed wires.

In the case of larger streams where damming of debris against the fence would constitute a danger, the opening below the lower fencing wire shall be closed by means of loose-hanging wire nets. For this purpose additional straining posts shall be planted on either side of the stream with a cable consisting of at least five strands of smooth fencing wire stretched between them. Onto this cable vertical strips of diamond mesh, hanging down to ground level, shall be fixed. The sides of the different strips of diamond mesh shall be fixed to each other so that the whole mat may be raised by water flowing underneath and so leave a free stream area. These mats at streams shall be erected only on instruction of the Engineer. If it should be necessary to keep the bottom of the mats on the ground, the Engineer may order that timber posts or pipes be fixed horizontally to the lower ends of the diamond mesh strips.

(f) Existing fences

Where a new fence joins an existing fence, whether in line or at an angle, the new fence shall be erected with a new straining post positioned at the terminal of the existing fence.

Existing fences that needs to be taken down or moved to a new location shall be dismantled. Material not required for re-erection or declared unsuitable for re-use

shall be neatly stacked at approved locations in accordance with the Engineer's instructions. Fencing wire or netting shall be stacked clear off the ground.

In the case of fences that require moving, the Contractor shall re-use all material declared suitable for this purpose by the Engineer, plus such new material as may be required to re-erect the fence to the standard specified for new fences. The Engineer shall not be responsible for any delays or costs arising from breakage of re-used wire during straining.

(g) Erecting gates

Gates shall be erected at the positions indicated by the Engineer. The gates shall be hung on gate fittings in accordance with the requirements specified. Gates shall be so erected that they swing in a horizontal plane at right angles to the gateposts, clear of the ground in all positions.

At pedestrian and security fences the double swing gates shall not leave a gap of more than 25mm between them when closed and other gates shall not be further than 25mm from the gate post when closed. The clearance below the gates shall not exceed 75mm with the gates closed.

(h) Repairs to fences

In the case of fences that require repairing, the Contractor shall re-use all material declared suitable for this purpose by the Engineer, plus such new material as may be required to re-erect the fence to the standard specified for new fences. The Engineer shall not be responsible for any delays or costs arising from breakage of re-used wire during straining.

If more than 50% of the fence needs to be repaired the repair work will be paid under item M310.02 as for a new fence.

(i) Closure of pedestrian thoroughfares

Where required by the Engineer pedestrian thoroughfares will be closed off with concrete or steel security palisade fencing of height as specified. Palisade fencing shall be of an approved proprietary product.

M3103 ACCEPTANCE CRITERIA

The completed fences shall be plumb, taut, true to line and ground contour, with all posts, standards and stays firmly set. Fencing wires shall not vary by more than 10mm from their prescribed relative vertical positions.

Where temporary fences are erected, they shall be firm and of sufficient height with sufficient number of wires to prevent the passage of livestock.

The Contractor shall, on completion of each section of fence, remove all cut-offs and other loose wire or netting so as not to create a hazard to grazing animals or a nuisance to the owners of the adjacent property.

M3104 MATERIALS

(a) Posts, stays, standards and droppers

Posts, stays, standards and droppers shall be of the type and size indicated on the drawings. Steel sections shall comply with the requirements of CKS 82 and the wooden posts shall comply with the requirements of SABS 457. Timber posts shall be treated with a preservative in accordance with the specified requirements.

Unless otherwise specified rolled steel posts shall be 15 or 22kg/m rails and galvanised. Standards shall be 2.50kg/m Y-sections.

Droppers shall be 0.56kg/m, ridgeback-pattern droppers.

Where tubular posts are specified they shall be galvanised in accordance with SABS 763 for Class B1 articles or shall be painted as specified and have a minimum wall thickness of 2.95mm. The Engineer shall direct the length, diameter and hole spacing. All tubular sections shall be provided with a 230mm x 230mm footplate and a pressed-steel or cast-iron cap.

Rolled steel sections shall be provided with a protective coating of tar or other approved material.

Tubular stays shall have a minimal bore of at least 60mm and a wall thickness of at least 2.95mm. They shall be galvanised as specified in SABS 763 or shall be painted as specified.

(b) Bolts for stays

Bolts shall be galvanised steel bolts of the required length and diameter. The diameter shall not be less than 12mm. All the necessary bolts, together with nuts and washers, shall be supplied with each post.

(c) Wire

(i) Barbed wire

Barbed wire shall comply with the requirements of SABS 675 and shall be one or more of the following types:

High tensile grade, oval shaped, single-strand wire, 3.15mm x 2.50mm (2.81mm equivalent diameter), and fully galvanised.

High tensile grade, oval shaped, single-strand wire, 2.80mm x 1.90mm (2.31mm equivalent diameter), fully galvanised (first class coating). This wire shall not be used less than 500mm above ground where there is a danger of grass fires.

Mild steel grade, double strand, unidirectional twist wire, each strand 2.50mm diameter, for use at any height above ground. The wire shall be fully galvanised.

Barbs shall be manufactured from 2.0mm galvanised wire and shall be spaced at not more than 152mm.

(ii) Razor tape wire

The product shall be fully galvanised and of high tensile grade.

(iii) Smooth wire

Smooth wire shall comply with the requirements of SABS 675 and shall be of the types specified below:

Straining wire shall be 4.0mm diameter and fully galvanised.

Fencing wire shall be high tensile grade, 2.24mm diameter wire, fully galvanised.

Tying wire shall be 2.50mm diameter, mild steel, galvanised wire for tying fencing wire to standards and droppers and 1.60mm diameter, mild steel, galvanised wire for tying netting and mesh wire to fencing wire.

(d) Diamond mesh

Diamond mesh (chain-link) fencing shall comply with the requirements of SABS 1373. The edge finish shall be clinched or barbed both sides.

The nominal diameter of the wire shall be 2.5mm and the mesh size shall be 64mm x 64mm.

The wire shall be fully galvanised.

(e) Wire netting

Wire netting shall be fully galvanised mild steel wire with a minimum diameter of 1.8mm and 75mm mesh.

(f) Gates

Gates shall be manufactured to the dimensions specified by the Engineer.

Gates shall be complete in every respect, including hinges, washers, bolts and locking chain attached to the gate.

(g) Timber posts for wire mats

Timber posts for holding down wire mats where the fence crosses streams shall comply with the requirements of SABS 457 and shall be creosote impregnated in accordance with SABS 05, with creosote complying with SABS 538 or 539.

(h) Manufacturing tolerances for wire

The actual diameter of wire supplied shall nowhere be less than the specified diameter by more than the following tolerances:

Specified diameter	Tolerance
1.0 - 1.8mm	0.05mm
2.0 - 2.8mm	0.08mm
3.15 - 4.0mm	0.10mm

M3105 TYPES OF FENCING

The following types of fences shall be erected in accordance with the dimensions specified:

- (a) Stock-proof fences (of various heights with horizontal barbed and smooth fencing wire)
- (b) Vermin-proof fences (horizontal barbed wire fence above a mesh wire fence)
- (c) Pedestrian fences (full height diamond mesh fence)
- (d) Security fences (veranda type with diamond mesh on vertical portions and barbed wire or razor tape wire on the overhang).

Where existing fences have to be dismantled and re-erected, they shall be erected either to the same design as the original, but with such modifications as may be required by the Engineer, or they shall be erected up to one of the standards specified above, all as ordered by the Engineer. No straining posts or standards are to be removed and are to be used in the new fence to be erected.

## M3106 PROTECTION OF LIVESTOCK

From the time of the occupancy of the site until completion of the contract, the Contractor shall take all measures necessary for preventing the ingress of vermin, and for protecting and controlling livestock, *inter alia*, on the sections of the properties affected by the operations. The Contractor shall provide gates in existing fences cut by him for the purpose of access and shall ensure that all gates are kept closed when not used for access.

Where alternative arrangements cannot be made, the Engineer may direct the Contractor to erect temporary fencing where necessary to protect livestock that may be lost or are exposed to vermin through the operations. Such fencing shall be of an adequate standard and be maintained in a good order. On completion of the work, it shall be removed from the site and all surfaces shall be restored.

Payment for the protection of livestock from the time that the dismantling of the fencing line commences until the replacement fencing has been erected will be deemed to be included in the rates tendered.

## M3107 MEASUREMENT AND PAYMENT

### M3100 FENCING

<u>Item</u>	<u>Unit</u>
M310.01 Clearing fence line 2m wide strip	kilometre (km)

The unit of measurement for the clearing of the fence line shall be the kilometre of fence line measured along each fence line.

The tendered rate shall include full compensation for the clearing of the fence line as specified, including the removal of trees, stones and other obstructions and the disposal as directed of all material resulting from clearing operations.

<u>Item</u>	<u>Unit</u>
M310.02 Erection of new fences:	
(a) Stock-proof fences	metre (m)
(b) Vermin-proof fences	metre (m)
(c) Pedestrian fences	metre (m)
(d) Security fences	metre (m)
(e) Steel palisade fences	metre (m)
(f) Concrete palisade fences	metre (m)

The tendered rate shall include full compensation for all overheads and transporting all labour, tools and materials from the Contractor's base to the point of the new fence. Item M310.02 (e) and (f) palisade fencing shall be erected in short sections.

The unit of measurement shall be the metre of each type of new fence erected as instructed by the Engineer.

The tendered rate shall include full compensation for all labour, tools, binding and tying wire for the new fence.

The supply of materials needed shall be paid under item M310.05.

<u>Item</u>	<u>Unit</u>
M310.03 Repair of existing fences of less than 100m lengths:	

(a)	Stock-proof fences	metre (m)
(b)	Vermin-proof fences	metre (m)
(c)	Pedestrian fences	metre (m)
(d)	Security fences	metre (m)
(e)	Steel palisade fences	metre (m)
(f)	Concrete palisade fences	metre (m)

The unit of measurement for item M310.03 shall be the metre of each type of existing fence repaired including the fence line as instructed by the Engineer.

The tendered rate shall include full compensation for all overheads and transporting, all labour tools and materials from the Contractor's base to the point of the fence repaired.

The supply of materials needed shall be paid for under item M310.05.

<u>Item</u>	<u>Unit</u>
M310.04 Repair of existing fence of more than 100m lengths:	
(a) Stock-proof fences	metre (m)
(b) Vermin-proof fences	metre (m)
(c) Pedestrian fences	metre (m)
(d) Security fences	metre (m)

The tendered rate shall include full compensation for all overheads and transporting, all labour tools and materials from the Contractor's base to the point of the fence repaired.

The unit of measurement shall be the metre of each type of fence repaired as instructed by the Engineer.

If more than 50% in length of the fence needs to be repaired the repair work will be paid under item M310.02 as for a new fence.

The tendered rate shall include full compensation for all overheads and transporting, all labour tools and materials from the Contractor's base to the point of the fence repaired.

The supply of materials needed shall be paid for under item M310.05.

<u>Item</u>	<u>Unit</u>
M310.05 Supply of fencing material for new and repaired fences:	
(a) Barbed wire (grade, size and type of galvanising indicated)	kilometre (km)
(b) Smooth wire (grade, size and type of galvanising indicated)	kilometre (km)
(c) Diamond mesh	square metre (m <sup>2</sup> )
(d) Wire netting	square metre (m <sup>2</sup> )
(e) Razor tape wire (with core thickness of 2,5mm)	kilometre (km)
(f) Corner, end and straining posts	number (No)
(g) Standards (length and type indicated)	number (No)
(h) Droppers (length and type indicated)	number (No)
(i) Timber posts to be fixed at the bottom of wire mesh in streams (diameter indicated)	metre (m)
(j) Steel palisade fence height 2,4m	metre (m)
(k) Concrete palisade fence height 2,4m	metre (m)

The quantity of material used shall be determined by measuring the quantities of individual items of material installed in the complete fence. The erection of fences shall be paid under items M310.02, M310.03 and M310.04.

The applicable units of measurement are as follows:



(a) Posts

The unit of measurement shall be the number of posts as follows:

All straining posts erected in accordance with the maximum specified spacing or such lesser spacing as authorised by the Engineer, all corner and gateposts authorised by the Engineer and all end posts. Gate posts for new gates shall not be measured for payment.

(b) Standards and droppers

The unit of measurement shall be the number of standards and droppers erected in accordance with the maximum specified spacing or such lesser spacing as authorised by the Engineer.

(c) Fencing wire

The unit of measurement shall be the kilometre of each type of fencing wire measured between end posts. Binding wire and wire used for bracing and anchoring of posts shall not be measured for payment.

(d) Diamond mesh and wire netting

The unit of measurement shall be the square metre of diamond mesh or wire netting and the quantity shall be calculated using the prescribed width and the length between straining posts or gate posts, or the length of strips for covering openings under fences, or the length used for the covering of gates.

(e) Timber posts fixed in stream crossings

The unit of measurement shall be the metre of timber posts of every diameter erected in accordance with the instructions of the Engineer.

The tendered rate for each post, standard, dropper and for each kilometre of fencing wire and each square metre of diamond mesh, and wire netting shall include full compensation for the provision of all materials, including concrete, binding wire, straining wire, bolts, washers and nuts, for excavation and drilling of holes for standards, for installation of posts, standards and droppers, and for the complete erection of the fence as specified. No separate payment shall be made in respect of stone packing and/or trenching in the case of wire netting. The tendered rate for posts shall include full compensation for the construction of the stays of the type authorised by the Engineer."

(f) Steel and concrete palisade fence

The unit shall be the metre of palisade fence erected as per drawing.

The tendered rate shall be fully inclusive of the costs of all labour, materials and equipment required for erection of the fence in short sections, complete in place.

Clearing of the fence line will be paid for under item M310.01.

<u>Item</u>	<u>Unit</u>
M310.06 New gates	
(a) Single leaf (size and type indicated)	number (No)
(b) Double leaf (size and type indicated)	number (No)

The tendered rate shall include full compensation for procuring and furnishing all material, including gates, gate posts, hinges, bob, concrete and straining wire, and for the erection of the gates as specified and as shown on the drawings. It shall not include compensation for any fencing wire or mesh erected on the gate.

The unit of measurement for moving existing fences shall be the metre of fence and the quantity shall be taken as the length of fence which is permanently erected using material arising from fences that have been dismantled elsewhere. Additional new material used during the re-erection of existing fences shall be measured under item M310.05. The unit of measurement for the moving of gates shall be the number of gates moved.

The tendered rate for each gate moved shall include full compensation for taking down the gate and re-erecting it where required, including all new bolts, nuts and other accessories required, but excluding new gate posts.

The unit of measurement shall be the metre of existing and damaged fencing and gates taken down and dismantled on instruction of the Engineer.

The tendered rate shall include full compensation for taking down existing fences and gates, coiling wires, rolling netting into rolls, transporting the material to designated sites and stacking the materials as required.

The unit of measurement shall be the number of holes for posts and anchors made by drilling and blasting where excavation by hand or by pneumatic tools cannot be done economically.

M3100/10

<u>Item</u>		<u>Unit</u>
M310.10	Provision of temporary fencing	
	(a) Stock-proof fences	kilometre (km)
	(b) Vermin-proof fences	kilometre (km)
	(c) Pedestrian fences	kilometre (km)

The unit of measurement shall be the kilometre of each type of temporary fence erected as instructed by the Engineer.

The tendered rate shall include full compensation for the provision of all labour, new or suitable second-hand material, including gates, for the erection of the temporary fence and, when no longer required, the dismantling and removal from site or to any new position where required.

**SERIES M3000 : ROADSIDE MAINTENANCE**

**SECTION M3200 : COLLECTION AND REMOVAL OF DEBRIS AND LITTER**

**CONTENTS**

M3201	SCOPE
M3202	EXECUTION OF WORK
M3203	ACCEPTANCE CRITERIA
M3204	MEASUREMENT AND PAYMENT

**M3201 SCOPE**

This section covers the work involved in collecting and removing of all foreign articles, debris, litter, posters and illegal signs of size less than 0,5m<sup>2</sup> from the road reserve, roadside stopping places, lay-byes and toll plazas as well as emptying of rubbish bins at all these areas.

**M3202 EXECUTION OF WORK**

**(a) Initial cleaning of the road reserve**

The Contractor shall, within the first four (4) weeks of the contract period, clean the road reserve 100% of all foreign articles which, inter alia, shall include:

- Litter
- Branches
- All stones larger than 75mm
- Building and garden rubble
- Tyres and stripped tyre treads
- Posters
- Old and new posters glued to concrete structures
- Illegal signs less than 0,5m<sup>2</sup>
- Graffiti on concrete structures
- Accident debris

The road reserve shall be cleaned from fence to fence, including interchanges, rest areas, lay-byes, toll plazas, side drains, all drainage grids, bridge drainage ports and scuppers and dustbins.

**(b) General cleaning of the road reserve**

The Contractor shall be responsible for keeping the road reserve clear of all foreign articles which, inter alia, shall include:

- Litter
- Branches
- Stones larger than 75mm but smaller than 300mm
- Tyres and stripped tyre treads
- Posters
- Illegal signs less than 0,5m<sup>2</sup>
- Accident debris

**(c) Dumping sites**

All material cleared from the road reserve shall be disposed of at approved

dumping sites or as instructed by the Engineer. The payment of fees and charges associated with the dumping sites shall be the responsibility of the Contractor. The location of dumping sites shall be the responsibility of the Contractor. Written approval from the landowners or local authorities on whose property the dumping occurs will be required. No dumping sites will be permitted within the road reserve area.

(d) Removal of litter and debris

Unless otherwise specified by the Engineer, the frequency for completing full width passes of the road and road reserve for collection of debris and litter, shall be as follows:

Urban roads:	Once per week
Peri urban roads:	Twice per month
Rural roads:	Once per month

It shall, however, be at the discretion of the Engineer to adapt the frequency of each road or section of road requiring litter collection and payment will be adjusted proportionately.

The Contractor shall inspect and remove all foreign articles, debris, rubbish and litter from the following areas at least once a week:

- Road pavement
- Lay-byes
- Toll plazas
- Down chutes
- Side drains
- All drainage grids
- Bridge drainage ports and scuppers
- Bridge expansion joints.

This shall also include the emptying of rubbish bins and cleaning of all containers and washing of benches and tables.

The Engineer may instruct additional clearing of the reserve and/or lay-byes, toll plazas and other areas as required.

The Contractor shall provide sufficient plastic bags and the necessary equipment such as sharp pointed steel rods for picking up plastic bags and paper items. The Contractor must ensure that all bottles, tins, *inter alia* hidden by the grass and shrubs, are removed. Work shall be undertaken progressively along the road reserve.

Litter, *inter alia* shall be collected on one side of the road in one day before crossing to the opposite side to reduce the number of crossings over the road.

The rubbish bag collection vehicle shall travel off the surfaced width of the road as far as possible and the bag collection operation shall be organised in such a way that filled bags left on the side of the road do not have to be carried across the road to the vehicle. Full bags shall not be left on the side of the road overnight. No dumping sites will be permitted within the reserve area and the Contractor shall be responsible for removing the filled bags to the nearest approved dumping site. The Contractor will be penalised as specified in the Project Specification if he does not comply with the abovementioned.

- (e) Cleaning of the SOS emergency call boxes

All the SOS emergency call boxes are to be properly cleaned once every two months or as instructed by the Engineer, using a suitable cleaning agent. At the same time all the call boxes are to be tested and faulty ones are to be reported immediately. The necessary precautionary measures are to be taken to ensure that moisture does not damage the electronic circuits.

- (f) Other requirements

At resting areas, lay-byes and toll plazas, damaged containers, tables and benches shall be replaced in accordance with the specifications and drawings and when instructed by the Engineer.

#### M3203 ACCEPTANCE CRITERIA

The road reserve shall be inspected after clearing operation and shall be completely cleared of all debris and litter.

The collected litter and debris shall not be dumped, *inter alia* over banks, into streams and manholes, but only at an approved location, arranged beforehand with the Engineer.

The stopping place areas shall be left clean and tidy with all containers cleared and benches and tables cleaned.

#### M3204 MEASUREMENT AND PAYMENT

The tendered lump sum shall include full compensation for all labour, equipment, tools and transport necessary for the cleaning of the road reserve as specified.

##### M3200 COLLECTION AND REMOVAL OF DEBRIS AND LITTER

<u>Item</u>	<u>Unit</u>
M320.01 Clearing of the road reserve	
(a) Urban roads (State section and km distance incl. interchanges)	month
(b) Peri urban roads (State section and km distance incl. interchanges)	month
(c) Rural roads (State section and km distance incl. interchanges)	month

The tendered rate per month shall include full compensation for all labour, tools equipment, and transport necessary for the collection and disposal of foreign articles as specified in this section. The tendered rate also includes the clearing of road pavement, rest areas, lay-byes, side drains, all drainage grids, bridge drainage ports and scuppers and rubbish bins as specified. The tendered rate shall also include the removal of rubbish bags from the toll plazas.

<u>Item</u>	<u>Unit</u>
M320.02 Additional clearing of	
(a) Lay-byes	number (No)
(b) Toll plazas	number (No)
(c) Interchanges	number (No)

(d) (Other as specified) number (No)

The unit of measurement for additional clearing at lay-byes, interchanges and other areas as specified is the number of such areas cleared on the instruction of the Engineer in addition to the Contractor's obligations under payment Clause M320.01.

<u>Item</u>	<u>Unit</u>
M320.03      Cleaning of the SOS emergency call boxes	number (No)

The unit of measurement for cleaning the SOS emergency call boxes shall be the number of units cleaned. Each time the "yellow infrastructure" of the call box is cleaned it will be measured for payment.

The tendered rate for the cleaning of the call boxes shall include full compensation for all work necessary for the proper cleaning of the yellow infrastructure and for reporting on the functioning of each call box.

**SERIES M3000 : ROADSIDE MAINTENANCE**

**SECTION M3300 : SHOULDER REPAIRS**

**CONTENTS**

M3301	SCOPE
M3302	EXECUTION OF WORK
M3303	ACCEPTANCE CRITERIA
M3304	MATERIALS
M3305	MEASUREMENT AND PAYMENT

**M3301 SCOPE**

This section covers the work necessary for reinstating the gravel shoulders of surfaced roads or gravel roads where specified.

**M3302 EXECUTION OF WORK**

**(a) Reinstatement of gravel shoulders**

**(i) Construction**

Shoulder reinstatement shall be carried out where the gravel shoulder is 50mm or more lower than the surfaced edge of the road and at busbays and stopping places where a drop off of more than 50mm exists or where the slope of a gravel shoulder must be reinstated to 3% or where directed by the Engineer.

Reconstruction of gravel shoulders consists of the following methods of placing and compaction:

1. Ripping, watering, placing and compacting of in situ shoulder material with or without adding extra material from a borrow pit. In the event of extra material having to be added, an extra over payment item is allowed in the Schedule of Quantities as well as for stabilising in situ or imported material (for tendering purpose the nominal rate of application cement shall be 60kg per cubic metre of stabilised material).
2. Construction of full depth gravel shoulder with material imported from borrow or shavings originating from milling out existing asphalt layers.

The shoulders and other areas shall be reinstated to the same level as the existing surfaced edge and with a minimum slope of 3% to shed water away from the road. Reinstatement shall be constructed at least to the same crossfall as the road. At busbays and stopping places the shoulders shall be built up with a maximum width of 2.0m from the edge surfacing. No additional payment shall be made for the reconstruction of gravel shoulders to restricted widths and lengths.

**(ii) Compaction**

The reinstated gravel shoulder shall be compacted to 93% modified AASHTO density.



When it is specified or instructed by the Engineer that the layer shall be tested with a Dynamic Cone Penetrometer (DCP) the average penetration recorded after 5 blows shall not exceed 50mm.

Material shall not be compacted in layers exceeding a thickness of 150mm, measured in the loose.

(b) Blading

The Engineer may order the blading of existing gravel shoulders using a motor-grader. The purpose of blading shall be to improve the condition and shape of existing shoulders without adding extra material from a borrow pit. Prior to the blading of shoulders, the in situ material shall be watered at a nominal rate of 5 litres per m<sup>2</sup> and allowed to properly infiltrate the layer until no free water is ponding on the surface. The bladed shoulder material shall be compacted with a pneumatic tyre roller of 27 ton mass for at least two passes.

M3303 ACCEPTANCE CRITERIA

Any surplus material resulting from the shoulder reinstatement work shall be removed completely and transported to spoil.

M3304 MATERIALS

The material to be used for reconstruction of the gravel shoulders shall be a uniform material approved by the Engineer, obtained from commercial sources identified by the Contractor. Gravel shall comply with a G7 quality as defined in TRH14. Only gravel material from soft excavation shall be utilised as shoulder material. Shavings originating from the milling out of existing asphalt surfacing layers may also be used to reconstruct eroded shoulders.

Generally the maximum size of the larger aggregates in the layer shall not exceed 30mm after compaction and the PI of the material before compaction shall not be less than 6 or exceed 12.

M3305 MEASUREMENT AND PAYMENT

M3300 SHOULDER REPAIRS

<u>Item</u>	<u>Unit</u>
M330.01 Reinstating gravel shoulders	
(a) Ripping, watering, mixing, placing and compacting existing shoulders to 93% of modified AASHTO density	cubic metre (m <sup>3</sup> )
(b) Extra over sub-item M330.01 (a) for adding extra material	cubic metre (m <sup>3</sup> )
(c) Extra over for sub-item M330.01 (a) for stabilising material	cubic metre (m <sup>3</sup> )
(d) Blading	kilometre (km)
(e) Cutting of mitre drains	metre (m)

The unit of measurement for sub-item M330.01 (a) shall be the cubic metre of material to be reworked for the reinstatement of gravel shoulders.

The tendered rate shall include full compensation for ripping the existing shoulder material, breaking down, watering, mixing of the material including any extra material added, compacting the material, including removal of 5% by volume of oversize material and transporting it over a

distance of 1,0km.

The unit of measurement for sub-item M330.01 (b) shall be the cubic metre of material added to the existing gravel shoulder to make up any shortfall of material for reconstruction of shoulders. The quantity of extra material added shall be taken as 70% of the volume of hauling trucks.

The tendered rate shall include full compensation for procuring the material from borrow pits, placing and spreading the material over the existing shoulders including transporting the material within a free-haul distance of 1,0km and removal of 5% of volume of oversize material and transporting it over a free-haul distance of 1,0km.

The unit of measurement for sub-item M330.01(c) shall be cubic metre of material stabilised including the stabilising agent if required by the Engineer at the required rate.

The tendered rates shall include full compensation for procuring materials as specified, labour, transport and for adding and mixing cement to in situ or imported material as required by the Engineer.

The unit of measurement of sub-item M330.01 (d) shall be the distance bladed over the full width of the shoulder measured in kilometres along the centre line of the road.

The tendered rate shall include full compensation for the watering, blading and compacting of existing gravel shoulders as specified and to the number of passes as directed by the Engineer. The tendered rate shall also include for the neat trimming and removal of gravel material spilt onto the existing road surfacing during blading operations.

The unit of measure for sub-item M330.01(e) shall be a metre of drain cut and excavated as specified.

The tendered rate for cutting the mitre drain shall include full compensation for cutting the mitre drain in accordance with instructions, excavating the material to specified depth, removing all excavated and loose material to the side and compacting the material. The tendered rate shall also include full compensation for all transport, handling, labour, material, compacting necessary for completing all the work in accordance with the specifications, and also for work in restricted areas.

Item

Unit

M330.02	Overhaul on material in excess of the free-haul distance of 1,0km.	cubic metre kilometre (m <sup>3</sup> -km)
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The unit of measurement shall be the cubic metre of material, hauled in excess of the 1,0km free-haul distance, multiplied by the average overhaul distance in excess of 1,0km free-haul.

The tendered rate shall include full compensation for hauling material in excess of the free-haul distance for importing material during shoulder reinstatement or for hauling and material removed during removal of edge build-ups in excess of the free-haul distance.

**SERIES M3000 : ROADSIDE MAINTENANCE**

**SECTION M3400 : MAINTENANCE OF ARRESTOR BED**

**CONTENTS**

M3401	SCOPE
M3402	EXECUTION OF WORK
M3403	MATERIALS
M3404	ACCEPTANCE CRITERIA
M3405	MEASUREMENT AND PAYMENT

**M3401 SCOPE**

This section covers the work necessary for levelling, removal of weeds and grass and “fluffing” of arrestor beds.

**M3402 EXECUTION OF WORK**

**(a) Fluffing**

The Contractor shall “fluff” the arrestor bed once a month or after every vehicle entry to reverse densification. Fluffing shall entail loosening the stone to the bottom of the arrestor bed and smoothing over the surface. This shall be achieved by dragging a fluffing claw through the entire width and breadth of the bed followed by brooming stone back into the bed and then raking smooth the surface.

**(b) Removal of fines**

The Contractor shall clean the stone of all fine material by dry or wet screening or washing once the uniformity co-efficient of 2 is exceeded or the bed grading moves out of the prescribed envelope. The Contractor shall monitor the material on a monthly basis.

**(c) Removal of grass and weeds**

The Contractor shall remove all weeds and grass growing in and spreading over the edges of the arrestor bed.

**(d) Replenishment of stone aggregate**

The Contractor shall replenish the stone aggregate by adding new stone as specified

**(e) Cleaning of drainage system within the arrestor bed**

The Contractor shall clean the drainage system as specified or instructed by the Engineer

**M3403 MATERIALS**

The stone aggregate for the arrestor bed shall comply with the following requirements:

<b>TABLE 3403/1: GRADING LIMITS FOR ARRESTOR BED SAND</b>	
<b>Sieve Size (mm)</b>	<b>Percentage passing through sieve by mass</b>
13,000	100%
9,500	88-100%
6,700	5-88%
0,075	0,5-5%

**M3404 ACCEPTANCE CRITERIA**

The cleaning, “fluffing” and replenishment of the stone aggregate for the arrestor bed shall be as specified in the Project Specifications.

The Contractor shall level the arrestor bed within 24 hours after an incident.

**M3405 MEASUREMENT AND PAYMENT**

**M3400 MAINTENANCE OF ARRESTOR BED**

<u>Item</u>	<u>Unit</u>
M340.01 Maintenance of arrestor bed	
(a) “Fluffing” arrestor bed once per month and after every vehicle entry (joy riding or emergency)	month
(b) Removal of fines	cubic metre (m³)
(c) Replenishment of the stone aggregate	cubic metre (m³)

The unit of measurement for sub-item M340.01 (a) shall be a fixed rate per month, which shall include full compensation for all labour, plant, tools and equipment necessary to “fluff” the arrestor bed.

The unit of measurement for sub-item M340.01 (b) shall be the cubic metre of stone successfully cleaned of fine material whether by dry or wet screening or washing. The rate shall include all temporary traffic accommodation measures to close off the arrestor bed, to remove the stone, to dry, screen and/or wash it, and return the stone to the arrestor bed. It shall include all labour, plant, tools, transportation and equipment necessary to clean the stone. Any transportation required in excess of the free-haul distance of 1,0km will be deemed to be included in the rate. At least the entire one half of the bed shall be so cleaned in a single operation, which must be completed within 72 hours. Base and surface stone aggregate shall be thoroughly mixed before returning it to the bed.

The unit of measurement for sub-item M340.01 (c) shall be the cubic metre of stone; source and grading to be approved by the Engineer, delivered to the arrestor bed. The tendered rate shall include full compensation for procuring and furnishing approved material irrespective of its origin and placing the material as specified.

**SERIES M3000 : ROAD SIDE MAINTENANCE**

**SECTION M3500 : STABILISATION OF CUTTINGS**

**CONTENTS**

M3501	SCOPE
M3502	DEFINITIONS
M3503	TRAFFIC CONTROL AND LANE CLOSURE
M3504	EXECUTION OF WORK
M3505	SAFETY OF PUBLIC TRAFFIC
M3506	DISPOSAL OF BARRED DOWN ROCK
M3507	MEASUREMENT AND PAYMENT

**M3501 SCOPE**

This specification covers the operations involved in the barring down and cleaning of loose rock and accumulative debris from the faces of the various cuttings and removing the material so produced to an approved disposal site. It also covers the inspections to be carried out prior to and after the completion of barring down operations and the method of measurement for payment purposes.

**M3502 DEFINITIONS**

**(a) Barring down**

Barring down shall mean dislodging and removing loose rock using manual or other means from its in situ position on a rock surface where it is considered by the Engineer to be unstable and a potential hazard to road users.

**(b) Cleaning**

Cleaning shall mean the removal of loose rock and accumulated debris on rock surfaces and ledges that can be efficiently or effectively removed by barring down, by means of brooms and shovels or by hand.

**M3503 TRAFFIC CONTROL AND LANE CLOSURE**

Prior to the commencement of any barring down and cleaning operations on any of the cuttings the Contractor shall ensure that the specified traffic barriers and other specified traffic control measures, including the metal road closure barrier gates are in place and approved by the Engineer.

**M3504 EXECUTION OF WORK**

**(a) Protective measures**

The Contractor shall take the necessary precautions to avoid any damage to the road surface of the work area at each cutting as a result of falling rocks and debris and the movement of plant and other construction activities required to undertake the barring down and cleaning activities or any other reason related to the Contractor's construction activities in this regard.

**(b) Inspection of cut face**

Prior to any portion of a face of a cutting being barred down, the Contractor shall make available suitable equipment together with a qualified operator with which a specialist representative of the Engineer together with a member of the Resident Engineer's Staff can be brought to within half a metre of any part of the surface of a

cutting. The specialist representative will undertake a detailed inspection of the rock surface to determine and identify the larger blocks of rock to be barred down. No other work of any nature whatsoever shall be permitted to be undertaken on the face of a cutting under inspection for the full duration of the inspection.

(c) Barring down

The Contractor shall have on site all the necessary equipment, plant, materials and personnel required to gain access to and dislodge all rock identified for barring down and to do so in compliance with all statutory and other requirements pertaining to matters regarding safety of personnel and the general public. Notwithstanding the marking out undertaken by the Engineer's specialist representative, the Contractor will be required to traverse every square metre of the rock surfaces requiring stabilisation and will tap and attempt to bar down all hollow sounding rock surfaces identified. The Contractor will continue with the barring down to the satisfaction of the Engineer and he may be required to reattempt to bar down sections of rock previously attempted or be required to reattempt to dislodge specific individual blocks of rock as may reasonably be required by the Engineer. Any rock or other material dislodged by barring down operations shall be brought onto the surface of the Contractor's work area without causing any damage to the road surface.

(d) Cleaning of rock surfaces

The Contractor will have on site all the necessary equipment, plant, materials and personnel required to gain access and to clean the entire rock surfaces by means of hand brooms and shovels. The cleaning of rock surfaces shall be undertaken once the barring down required is complete at a particular section of a cutting. Cleaning shall be undertaken from the top down to ensure that all loose rock and debris is systematically removed from the rock surfaces and ledges and is not redeposited on an adjacent section of rock surface previously cleaned. The Contractor shall remove any rock or debris so redeposited at no extra cost and all rock surfaces shall be cleaned to the satisfaction of the Engineer.

M3505 SAFETY OF PUBLIC TRAFFIC

The Contractor will ensure the absolute safety of all public traffic. In the event that fragments of rock are deposited onto the lane reserved for use by public traffic, the Contractor shall make all suitable arrangements to clear the lane of such fragments of rock and other hazardous material within the times specified for the barring down operations unless otherwise permitted by the Engineer in writing. The Contractor shall also within this time effect any repairs to the road surface to the satisfaction of the Engineer to make it trafficable and safe for public traffic.

The Contractor shall also make all arrangements required to eliminate any risk of loose rock falling onto railway lines as a result of his construction or other activities.

M3506 DISPOSAL OF BARRED DOWN ROCK

All loose material resulting from the barring down and cleaning operations shall be loaded and transported to the approved disposal site.

M3507 MEASUREMENT AND PAYMENT

M3500 STABILISATION OF CUTTINGS

<u>Item</u>	<u>Unit</u>
M350.01 Barring down of rock surfaces in the vertical height intervals stated.	square metre (m <sup>2</sup> )

Heights shall be measured from the outer edge of the road at the toe of the cutting.

The unit of measurement shall be the square metre area indicated by the Engineer on site where rock is to be barred down in accordance with the Engineer's instruction. Barring down will be measured once only, irrespective of the number of times the Contractor is required to re-access the face of the cutting to complete the work to the satisfaction of the Engineer.

The tendered rate shall include full compensation for access to the rock face, barring down of rock using suitable tools and equipment, adhering to safety and other statutory precautionary measures, labour, plant, materials and all other necessary incidentals to complete the works in accordance with the specifications and the Engineer's instructions. The rate shall also include for all costs and delays for providing the Engineer with access to the rock face as specified in the Project Specifications.

<u>Item</u>	<u>Unit</u>
M350.02      Disposal of rock debris	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of rock debris which has accumulated at the toe of the cuttings as a result of the barring down and/or cleaning of the rock surfaces and from the crests of the rock cuttings. The debris to be removed and measured under this item shall also include existing debris which has accumulated at the toe of the cutting over the years. The measured volume of debris removed and disposed of shall be 50% of the loose volume hauled away in the hauling vehicles to the approved disposal site.

The tendered rate shall include full compensation for loading, transporting and spoiling the material at the approved disposal site, including all labour, plant, materials and all other incidentals to complete the works in accordance with the specifications and the Engineer's instructions. The tendered rate shall include full compensation for transporting the excavated material for a free-haul distance of 1.0 km.

<u>Item</u>	<u>Unit</u>
M350.03      Overhaul on material for haul in excess of 1.0 km	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of material hauled in excess of 1.0 km, volume of material measured loose in truck in the case of barred down material transported to spoil, multiplied by the overhaul distance.

The tendered rate shall include full compensation for hauling the material in excess of the free-haul distance.

**SERIES M4000 : ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE**

**SECTION M4100 : ERECTION AND REPAIR OF PERMANENT ROAD TRAFFIC SIGNS**

**CONTENTS**

M4101	SCOPE
M4102	STORAGE AND HANDLING
M4103	EXECUTION OF THE WORK
M4104	MATERIALS
M4105	PROTECTION AND MAINTENANCE
M4106	DISMANTLING, STORING AND RE-ERECTING EXISTING ROAD SIGNS
M4107	MEASUREMENT AND PAYMENT

**M4101 SCOPE**

This section covers the erection of permanent road traffic signs. It includes the repair and replacement of faded, damaged or not clearly visible existing signboards and reference marker boards.

Specifications relating to manufacturing of road signs are excluded, as relevant specifications regarding manufacturing will be issued to a nominated Subcontractor who shall be a recognised manufacturer of road signs.

The signs shall be of the standard regulatory, guidance, warning and information signs and shall be fabricated in accordance with the latest South African Road Traffic Signs Manual except where otherwise specified, indicated on drawings or directed by the Engineer.

The erection and placement of any signs, whether temporary or permanent, shall be in accordance with Chapter 13 of Volume 2 of the South African Road Traffic Signs Manual.

**M4102 STORAGE AND HANDLING**

All road signs or parts of road signs shall be so transported and so handled and so stored in a weatherproof storeroom as to prevent any damage and deformation.

Signboards shall be stored on blocks in the vertical position so that the signs are not in contact with the ground. There shall be sufficient space between the finished road signboards to permit free air circulation and moisture evaporation. Contact of road signboards with treated timber and diesel, or storage where road sign boards come into contact with dirt or water will not be permitted.

When required, existing or newly erected road signs shall be fully or partially covered with burlap or other approved adequately ventilated material to obscure destinations that are temporarily inapplicable or irrelevant. The covers shall be neatly applied and firmly fixed in position so that they will be able to withstand strong gusts of wind or eddies caused by passing traffic. The fixing shall be done in a way that will not cause any damage to the road sign face.



## M4103 EXECUTION OF THE WORK

### (a) Position

Road signs shall be erected in the positions shown on the drawings or indicated by the Engineer.

### (b) Excavation and backfilling

Excavations for the erection of road signs shall be made according to the dimensions shown on the drawings. Where the excavations are to be backfilled with soil, a 1:12 cement/soil mixture shall be made if so required by the Engineer. The soil or soil-cement mixture shall then be placed at optimum moisture content in 100mm thick layers in the excavation and shall be compacted to a minimum of 90% of modified AASHTO density.

Where posts or structures are to be fixed in concrete, or where concrete footings are to be cast, the concrete, formwork and reinforcement shall comply with the relevant requirements. The holes shall be completely filled with concrete up to the level shown on the drawings or indicated by the Engineer. The upper surface of the concrete shall be neatly finished with sufficient fall to ensure proper drainage.

This Subclause shall apply to ground-mounted signs only. Excavating and backfilling for the foundations of overhead steel structures are specified and regarded as specialised structural work.

Excavation in rock shall be paid for under item M410.06.

When material from the excavations is not suitable for backfilling or for the preparation of soilcrete, suitable material shall be obtained as instructed by the Engineer.

### (c) Erection

Road signboards must be inspected by the Engineer and approved in writing before the boards are taken from the campsite to the erection site. The Contractor shall notify the Engineer at least one (1) week before the said inspections are required.

Road signs shall be erected strictly in accordance with the details and instructions on the drawings and as directed by the Engineer.

During erection the structural steelwork shall be firmly bolted and protected to prevent buckling or damage from being caused during erection, or by the equipment used for erection.

Posts to which road signs are to be fixed shall be vertical and the undersides of road signs shall be horizontal after having been erected.

Where timber posts are used for erecting the signs, all holes drilled in the timber shall be re-treated with the approved preservative. A road sign identification number (as indicated on the layout drawing) and a code III-MM-YY indicating the initials of the manufacturer, the month and the year of manufacture of the sign. The identification number and code shall be provided on the reverse side of the road signboard in 50mm high letters and numbers for overhead signs and 25mm for ground mounted signs on the side closest to the road shoulder as directed by the Engineer.

Any sign damaged during transit to the erection site or during the erection process shall be replaced or repaired to the satisfaction of the Engineer at no extra cost to the Employer.

(d) Field welding

All welding done during erection shall comply with the requirements for welding during manufacture.

(e) On-site painting

All painting done after the road signs have been erected shall comply with the requirements for painting during manufacture.

The Contractor, at his own cost, shall repair all places where the paintwork has been damaged during erection to the satisfaction of the Engineer.

(f) Time of erection

Road signs shall be erected in the time specified below for each type of sign.

Time for completion is defined as that period from the date on which an instruction is received by the Contractor from the Engineer, to the date of full completion.

<u>Type of sign</u>	<u>Time for completion</u>
R – Series	2 days
W – Series	2 days
G – Series	4 days after date of delivery
Information signs	4 days after date of delivery

(g) Penalty for late erection

The penalty per offence as specified in the Project Specifications shall apply if the signs are not erected in the specified time period, or as instructed by the Engineer in writing from time to time.

(h) Attachment of overlays

The type of the overlay to be used will be specified by the Engineer and will consist either of 1mm thick Chromadek plate, pop-riveted onto the existing sign plate, or System 5 overlay or similar approved.

Before the application of the overlay to any structure, the existing signboard shall be thoroughly cleaned.

(i) Repair of signs

The Engineer may require that certain existing signs be dismantled for repair work or storage and later re-erected. The signs shall be repainted or repaired, by replacing the 200mm profiles or straightening the sheet metal, in accordance with the methods and requirements specified during the manufacturing process. New materials shall be used for part or all of the supporting structure. This work shall be done with as little damage as possible to the signs.

(j) General

All destinations and route numbers shown on the drawings shall be subject to amendment and confirmation, and the details shall be obtained from the Engineer before any particular signs may be erected. Such particulars may be available only at a late stage, for which the Contractor shall make allowance in his programme.

#### M4104 MATERIALS

(a) Timber posts for road sign supports

Timber posts for road sign supports shall conform to the requirements of SABS 754, shall be equal to or better than strength group B timber posts and shall be stamped with the SABS mark. The exposed surface of the cut shall be given two coats of creosote. Any holes drilled in the timber posts after treatment with creosote shall be re-treated.

(b) Corrosion-protection tape

Corrosion-protection tape used between aluminium and steel shall be black PVC tape not less than 0,25mm in thickness, shall be resistant to ultra-violet rays, and shall have an adhesive backing. The breaking strength of the material shall not be less than 3,5kN/m.

#### M4105 PROTECTION AND MAINTENANCE

The Contractor shall protect the completed road signs against damage until the Employer has finally accepted them, and the Contractor shall maintain the road signs until the Taking Over Certificate has been issued. Damage or defects caused by negligence or faulty workmanship shall be rectified by the Contractor, at his own cost, to the satisfaction of the Engineer.

The Contractor shall, within two weeks after the commencement date of the Contract, submit to the Engineer a list of all road signs (including posts) which have been damaged due to veld fires. The signs, which have been identified and approved, will be replaced and paid under this section. The Contractor shall control all vegetation growth around signs in such a way necessary to prevent any damage to the signs due to veld fires. The Contractor will replace all signs damaged due to veld fires at the Contractor's own cost.

#### M4106 DISMANTLING, STORING AND RE-ERECTING EXISTING ROAD SIGNS

Where ordered by the Engineer, the Contractor shall dismantle existing road signs, store them, and re-erect them at new positions indicated. This work shall be done with as little damage as possible to the signs.

The method for dismantling the existing signs and transporting and storing the signs shall be subject to the Engineer's approval. No additional payment shall be made for any equipment or handling methods necessary to prevent damage to existing signs which are suitable for re-use, as ordered by the Engineer.

Where required by the Engineer, the signs shall be repainted or repaired and new materials shall be used for part or all of the supporting structure.

#### M4107 MEASUREMENT AND PAYMENT

##### M4100 ERECTION AND REPAIR OF PERMANENT ROAD TRAFFIC SIGNS

<u>Item</u>	<u>Unit</u>
M410.01 Erection or re-erection of road signboards	
(a) Area not exceeding 2m <sup>2</sup>	square metre (m <sup>2</sup> )
(b) Area exceeding 2m <sup>2</sup> but not 10m <sup>2</sup>	square metre (m <sup>2</sup> )
(c) Area exceeding 10m <sup>2</sup> square	metre (m <sup>2</sup> )
(d) Overhead road signboards	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of completed road sign erected as required in the Project Specification, instructions or drawings issued by the Engineer.

The tendered rates shall include full compensation for attaching the road signboard to a road sign support structure, or to an overhead road sign support structure or to an overbridge and for all equipment, labour, supervision, nuts, bolts, transport, handling, *inter alia* necessary for the installation of the road signboard.

<u>Item</u>	<u>Unit</u>
M410.02     Road sign supports (overhead road sign structures excluded)	
(a)     Steel tubing (diameter and wall thickness indicated)	metre (m)
(b)     Timber (diameter and type indicated)	metre (m)

The unit of measurement for sub-item M410.02 (a) for erecting supporting structures manufactured from steel tubing shall be the metre of steel tubing used. Bolts and other accessories shall not be measured separately.

The unit of measurement for sub-item M410.02 (b) for erecting timber supporting structures shall be the metre of each diameter post used. Bolts and other accessories shall not be measured. Only the actual length of completed posts will be measured. Cut-off sections will not be measured.

The tendered rates shall include full compensation for erecting the road sign supports, including all bolts, screws, rivets, welding and accessories, together with the painting and galvanising required and the provision and treatment of breakaway holes in timber supports.

The tendered rates shall also include full compensation for tying up, clearing, trimming, disposing of material at approved dumping sites provided by the Contractor, and finishing the area around each sign footing.

Overhead road sign supporting structures shall not be measured and paid for under this item, but shall be considered as specialised structural work.

<u>Item</u>	<u>Unit</u>
M410.03     Reference marker boards (type indicated)	number (No)

The unit of measurement shall be the number of reference marker boards including posts supplied and erected in accordance with the drawings.

The tendered rate shall include full compensation for all the labour, excavation, backfilling with soil or concrete, *inter alia*, as may be necessary for completing the work in accordance with the details shown on the drawings.

<u>Item</u>	<u>Unit</u>
M410.04     Excavation and backfilling for road sign supports (not applicable to reference marker board posts)	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of excavation measured in place according to the neat dimensions of the footings or excavations as shown on the drawings or directed by the Engineer. In the case of timber posts not in concrete, the plan area of the excavated hole shall be taken as 0,15m<sup>2</sup>, irrespective of the actual size of the excavated hole.

The tendered rate shall be in full compensation for excavating, backfilling and compacting the backfill material, for the disposal of all surplus excavated material, and for providing the backfill material.

<u>Item</u>	<u>Unit</u>
M410.05      Extra over item M410.04 for cement-treated soil backfill	cubic metre (m <sup>3</sup> )

The tendered rate shall include full compensation for the additional cost of providing and mixing in cement.

<u>Item</u>	<u>Unit</u>
M410.06      Extra over item M410.04 for rock excavation	cubic metre (m <sup>3</sup> )

The tendered rate shall include full compensation for the additional cost of excavating in rock.

<u>Item</u>	<u>Unit</u>
M410.07      Dismantling, storing and re-erecting road signs with a surface area of:	
(a)          Up to 2m <sup>2</sup>	number (No)
(b)          Exceeding 2m <sup>2</sup> but not 10m <sup>2</sup>	number (No)
(c)          Exceeding 10m <sup>2</sup>	number (No)

The unit of measurement shall be the number of signs dismantled, stored and re-erected in each size group.

The tendered rates shall include full compensation for dismantling and storing the road signs and supporting structures, transporting the material to a new location, re-erecting the road signs, and restoring the location where they were dismantled.

Payment for excavations, and the new material and concrete required for re-erecting the road signs shall be made under the appropriate item, and any repairs and painting which may be necessary, shall be paid for under "repair of road sign faces". No separate payment shall be made for new bolts and nuts required for such re-erection, the cost of, which shall be included in the rates tendered above.

<u>Item</u>	<u>Unit</u>
M410.08      Dismantling and storing road signs with a surface area of:	
(a)          Up to 2m <sup>2</sup>	number (No)
(b)          Exceeding 2m <sup>2</sup> but not 10m <sup>2</sup>	number (No)
(c)          Exceeding 10m <sup>2</sup>	number (No)

The unit of measurement shall be the number in each size group dismantled and stored on instruction of the Engineer.

The tendered rates shall include full compensation for carefully dismantling and disassembling the road signs, loading, transporting, off-loading and carefully stacking all the materials as required by the Engineer. It shall also include compensation for restoring the site where the road signs have been dismantled.

The tendered rates shall also include full compensation for demolishing the concrete footings of existing signs to at least 200mm below the adjacent ground level, disposing of the resulting debris at approved dumping sites provided by the Contractor, and cutting timber or steel support structures at not less than 200mm below the adjacent ground level.

<u>Item</u>	<u>Unit</u>
M410.09      Gravel drainage layer below road sign footings	cubic metre (m <sup>3</sup> )

The unit of measurement is the cubic metre of compacted gravel placed below road sign footings in accordance with the details on the drawings. The quantity will be calculated from the authorised dimensions, and gravel placed outside the authorised dimensions will not be measured for payment.

The tendered rate shall include full compensation for procuring, furnishing and placing the gravel.

<u>Item</u>	<u>Unit</u>
M410.10      Hazard plates (size indicated)	number (No)

The unit of measurement is the number of each size of hazard plate including posts supplied and erected complete in accordance with the details on the drawings.

The tendered rate shall include full compensation for excavating, disposing of excavated material (including overhaul), erecting and for placing and compacting the soilcrete backfilling.

<u>Item</u>	<u>Unit</u>
M410.11      Repair of road sign faces	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of sign face repaired on the instruction of the Engineer. Only the portion of the sign face actually repaired shall be measured for payment.

The tendered rate shall include full compensation for procuring and furnishing all the necessary material, labour and equipment and for repairing as specified.

<u>Item</u>	<u>Unit</u>
M410.12      Concrete in road sign footings (class indicated)	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of concrete in place.

The tendered rate shall include full compensation for procuring and furnishing all materials, mixing, transporting, placing and compaction of the concrete.

<u>Item</u>	<u>Unit</u>
M410.13      Attachment of overlays to existing road signs (type specified)	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of overlays attached to the existing signboard.

The tendered rate shall include full compensation for labour, transport and materials necessary for attaching the overlay to existing road signs.

<u>Item</u>	<u>Unit</u>
M410.14      Removal of road sign supports	number (No)

The unit of measurement shall be the number of road sign supports removed.

The tendered rate shall include full compensation for removing road sign supports on the instruction of the Engineer, demolishing of concrete footings to at least 200mm below adjacent ground level and disposing of resulting debris.

<u>Item</u>	<u>Unit</u>
M410.15 Procurement of road signboards	
(a) Purchase of manufactured road signboards	Provisional sum (Prov Sum)
(b) The Contractor's overhead charges and profit in respect of sub-item M410.15(a).	percentage (%)

Measurement and payment shall be in accordance with the provisions of Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999

The tendered rate for M410.15 (b) shall include full compensation for all overheads, transport, supervision, profit and other costs incurred in the purchase of road sign material.

<u>Item</u>	<u>Unit</u>
M410.16 Erection and repairs of gantry structures	
(a) Erection and repairs of gantry structures	Provisional sum (Prov Sum)
(b) The Contractor's overhead charges and profit in respect of sub-item M410.16(a).	percentage (%)

Measurement and payment shall be in accordance with the provisions of Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999.

The tendered rate for item 410.16 (b) shall include all overheads, profit, transport, supervision and other costs incurred for appointing and utilising a selected specialist Subcontractor for erection and repairs of gantry structures.

**SERIES M4000 : ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE**

**SECTION M4200 : ROAD SIGN CLEANING AND REMOVAL OF ILLEGAL SIGNS**

**CONTENTS**

M4201	SCOPE
M4202	EXECUTION OF WORK
M4203	ACCEPTANCE CRITERIA
M4204	MEASUREMENT AND PAYMENT

**M4201 SCOPE**

This section covers the cleaning of existing permanent road signs which faces appear dirty, faded or non-reflective as well as the removal of illegal signs.

**M4202 EXECUTION OF WORK**

**(a) Cleaning of road signs**

The Engineer shall indicate which signs are to be cleaned when cleaning is to be carried out.

Sign faces shall be cleaned using a non-abrasive cleaner with a pH of 6 to 8. Approved sign cleaning equipment such as the "Highway Handyman" cleaner shall be used.

All loose dirt and cleaners shall be washed from the sign. High pressure spray on the signs shall be avoided.

To reach the large overhead signs for cleaning, the Contractor shall use a truck with a hydraulic lift and shall take all necessary precautions not to damage the road surface when positioning the truck.

**(b) Illegal signs: removal**

Only on the instruction of the Engineer shall illegal signs be removed and disposed of or stored if required. Any inquiries from outside parties regarding the removal of illegal road signs shall be directed to the Engineer.

**(c) Removal of graffiti**

On instruction from the Engineer the Contractor shall remove graffiti from road sign faces and structures.

**(d) Painting of metal road sign elements**

Metal road sign supports and frames of sign faces which are showing a degree of corrosion, shall be repainted with the same type of paint used during the initial manufacturing of the sign elements. All corroded parts to be repainted shall first be properly cleaned using wire brushes, sanding paper, or other effective cleaning apparatus, to such an extent that no trace of rust can be observed all to the satisfaction of the Engineer.



M4203 ACCEPTANCE CRITERIA

All sign faces shall be cleaned such that their reflectivity is restored.

M4204 MEASUREMENT AND PAYMENT

M4200 ROAD SIGN CLEANING

<u>Item</u>	<u>Unit</u>
M420.01 Road sign cleaning	
(a) Cleaning of guard-rail reflectors (all types)	number (No)
(b) Cleaning of road signs	
(i) Up to 2m <sup>2</sup>	number (No)
(ii) Exceeding 2m <sup>2</sup> but not 10m <sup>2</sup>	number (No)
(iii) Exceeding 10m <sup>2</sup>	number (No)
(c) Cleaning of overhead road signs (all sizes)	number (No)

The unit of measurement shall be the number of guard-rail reflectors and road signs cleaned.

The tendered rates shall include full compensation for all labour, material and equipment necessary for cleaning the signs as well as overhead signs. It shall include for the provision and application of the specified cleaning detergent.

<u>Item</u>	<u>Unit</u>
M420.02 Removal of graffiti	
(a) From road signs	square metres (m <sup>2</sup> )
(b) From structures	square metres (m <sup>2</sup> )

The unit of measurement shall be the area of the restored surface cleaned on instruction from the Engineer.

The tendered rate shall include full compensation for all labour, cleaning materials, patent products (e.g. Synchrokleen or similar), equipment, transport and overheads necessary for restoration of the surfaces.

<u>Item</u>	<u>Unit</u>
M420.03 Painting of metal road sign elements	
(a) Sign supports	litre (l)
(b) Sign frames	litre (l)

The unit of measurement shall be the litre of road sign paint as per manufacturer's specifications.

The tendered rate shall include full compensation for the supply and application of one coat of the specified paint to sign supports and frames. The tendered rate shall also include for the cleaning and preparation of the elements, as specified, before the application of the paint.

M4210 REMOVAL OF ILLEGAL SIGNS

<u>Item</u>	<u>Unit</u>
M421.01 Removal of illegal signs	number (No)
(a) Signs within the road reserve:	
(i) Exceeding 0,5m but not 2m <sup>2</sup>	number (No)
(ii) Exceeding 2m <sup>2</sup> but not 10m <sup>2</sup>	number (No)
(iii) Exceeding 10m <sup>2</sup>	number (No)
(b) Signs outside the road reserve:	
(i) Any size	Provisional sum (prov sum)
(ii) The Contractor's overhead charges and profit in respect of sub-item M421.01 (b)(i)	percentage (%)

The unit of measurement for sub-item M421.01 (a) shall be the number of illegal road signs removed on instruction of the Engineer in each size category.

The tendered rate shall include full compensation for all labour, equipment, transport and overheads necessary for removal of the illegal signs.

For sub-item M421.01 (b) the measurement and payment shall be in accordance with the provisions of Subclause 13.5 of The FIDIC Conditions of Contract for Construction 1999.

The tendered percentage is a percentage of the amount actually spent under sub sub-item M421.01 (b) (i) which shall include full compensation for the overhead charges and profit of the Contractor.

**SERIES M4000 : ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE**

**SECTION M4300 : ROADSTUDS**

**CONTENTS**

M4301	SCOPE
M4302	EXECUTION OF WORK
M4303	MATERIALS
M4304	ACCEPTANCE CRITERIA
M4305	MEASUREMENT AND PAYMENT

**M4301 SCOPE**

This section covers the supply and fixing of retro-reflective roadstuds on surfaced roads. It includes the removal and replacement of damaged roadstuds as well as the cleaning thereof where instructed by the Engineer.

A nominated Subcontractor with relevant experience shall undertake the supply and fixing of roadstuds.

**M4302 EXECUTION OF WORK**

**(a) Installation**

Roadstuds shall be of similar type as existing roadstuds on the road surface or as instructed by the Engineer. The studs shall be fixed in the positions indicated and approved by the Engineer.

Roadstuds shall be supplied by the Contractor and shall be fixed in the positions instructed and approved by the Engineer.

The road surface where roadstuds are to be fixed shall be clean and dry and completely free from any soil, grease, oil, acid or any other material, which will be detrimental to the bond with the adhesive material.

The adhesive to be used shall be as specified by the roadstud manufacturer, or as instructed by the Engineer and the epoxy adhesive shall be thoroughly mixed in the proportions recommended by the manufacturer.

The adhesive shall be applied to the road surface using a 1mm thick steel template so that, after installation of the roadstud, the pad of epoxy is clearly visible around the circumference of the roadstud.

The Contractor must ensure that the studs are protected against impact until the adhesive has achieved the necessary strength, which period shall not be less than three hours.

**(b) Replacement**

When instructed by the Engineer damaged roadstuds shall be removed flush with the road pavement with no protuberances or depressions. Any holes left after removal shall be backfilled with asphalt mix. The asphalt material shall be thoroughly consolidated in the hole by means of a heavy steel stamper. New studs shall not be fixed in the same positions where damaged studs were removed, but installed 150mm away longitudinally.

(c) Cleaning

When instructed by the Engineer, roadstuds shall be cleaned at locations indicated in order to restore the reflectivity thereof. Where roadstuds require cleaning in the Contractor's opinion, written notice shall be given to the Engineer who may instruct the Contractor to proceed with the cleaning of the roadstuds at those sections of the road indicated.

Cleaning equipment and detergent shall be non-abrasive to the surface of the road stud. Adequate equipment shall be supplied by the Contractor to ensure effective removal of all dirt, grime and tar. All loose dust and detergent should be washed from the surface of the road.

M4303 MATERIALS

Roadstuds shall comply with the requirements of SABS 1442 category A, B and C and shall be of the size and type specified in the Project Specifications or as instructed by the Engineer. The Contractor shall, prior to delivery, submit to the Engineer samples of the type of roadstuds the Contractor proposes to supply for approval.

M4304 ACCEPTANCE CRITERIA

The roadstuds shall be fixed to the road surface at correct intervals and positions.

The entire base of the stud shall be bonded to the road surface.

No adhesive material shall be left on the reflective faces of the roadstuds.

M4305 MEASUREMENT AND PAYMENT

M4300 ROADSTUDS

<u>Item</u>	<u>Unit</u>
M430.01 Installation of roadstuds	
(a) Provisional sum for installation of roadstuds	Provisional sum (Prov Sum)
(b) The Contractor's overhead charges and profit in respect of sub-item M430.01 (a)	Percentage (%)

For sub-item M430.01 (a) the measurement and payment shall be in accordance with the provisions of Subclause 13.5 of The FIDIC Conditions of Contract for Construction 1999.

The tendered percentage is a percentage of the amount actually spent under sub sub-item M430.01 (b) which shall include full compensation for the overhead charges and profit of the Contractor.

<u>Item</u>	<u>Unit</u>
M430.02 Removal of damaged roadstuds	
(a) Surface type	
(i) Bituminous pavements (specify type of roadstud)	number (No)
(ii) Concrete pavements	number (No)

(specify type of roadstud)

- |      |  |             |
|------|--|-------------|
| (b)  | Embedded type                                      |             |
| (i)  | Bituminous pavements<br>(specify type of roadstud) | number (No) |
| (ii) | Concrete pavements<br>(specify type of roadstud)   | number (No) |

The unit of measurement shall be the actual number of studs removed.

The tendered rate shall include full compensation for all labour and tools necessary to remove the studs and disposal thereof. In the case of the surface type with shanks the tendered rate shall include for backfilling of the holes as prescribed.

**SERIES M4000 : ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE**

**SECTION M4400 : GUARD-RAIL ERECTION AND MAINTENANCE**

**CONTENTS**

M4401	SCOPE
M4402	EXECUTION OF WORK
M4403	ACCEPTANCE CRITERIA
M4404	MATERIALS
M4405	INSTALLATION AND REPAIRING OF WIRE ROPE SAFETY FENCE
M4406	MEASUREMENT AND PAYMENT

**M4401 SCOPE**

This section covers the supplying and installation of new guard-rails, and the maintenance of existing guard-rails.

This section shall also include the removal, straightening, re-alignment, renovation and re-erection of damaged guard-rails.

**M4402 EXECUTION OF WORK**

**(a) Erection of new guard-rails**

New guard-rails shall be erected at locations as directed by the Engineer.

The holes for timber posts shall be of sufficient size to permit proper setting of the posts. At least 1,0m of a post shall be embedded in the ground.

The posts, spacer blocks and guard-rails shall be completely erected and set true to line and level so that the guard-rail will be at the required height above the level of the road shoulder.

Where jointed, the end of the guard-rail which overlaps on the side of the traffic shall point in the direction of the traffic movement. The guard-rail shall be suitably braced to prevent any movement, and all bolts shall be tightened prior to any holes being backfilled.

After the Engineer has approved the guard-rails so erected, the holes shall be backfilled with an approved sandy soil. The material shall be mixed with the correct quantity of water to ensure that the mixture will be placed while at or near the optimum moisture content. The mixture shall then be placed and thoroughly rammed in layers not exceeding 100mm of compacted thickness.

The approach ends, where the guard-rail has to be bent down and anchored, and the trailing ends shall be constructed as shown on the drawings.

The edges and the centre of the guard-rails shall touch either the spacer block or the post where no spacer blocks are used. All splices of guard-rail shall be at posts and shall make contact over the entire area of the splice.

Guard-rail posts other than timber shall be erected and fixed as shown on the drawings or as instructed by the Engineer.

Reflective plates shall be fixed in accordance with the details shown on the drawings. The reflective surface shall be arranged with the colours as shown on the drawings.

(b) Removing, renovating and re-erecting damaged guard-rails

The Engineer shall approve removal, renovation and re-erection of guard-rails.

(i) Removing the guard-rails

All guard-rails, reflective plates and end units shall be carefully dug out and the holes shall be filled and compacted in 150mm layers. Items used for fixing, such as bolts, units and washers, together with the reflective plates, shall be placed into bags, after which all the material shall be transported to a store approved by the Engineer and all stored in groups by type.

Where material is intended for re-use, it shall first be unpacked for inspection by the Engineer for deciding which material will be suitable for re-use. Suitable material shall then be stored separately from material, which is unsuitable for re-use.

(ii) Renovated guard-rails

Units suitable for re-use shall be taken to the workshop for renovating if required.

Posts suitable for re-use shall be cleaned and treated with a timber preservative. Bolts, nuts and washers to be re-used shall be cleaned and all rust removed, and shall then be oiled.

The units shall be straightened by means of a hydraulically or electrically powered machine capable of straightening guard-rails to their original profile. If necessary, holes shall be redrilled to original positions. Rust shall be completely removed and minor indentations hammered out.

No additional payment will be made for renovating the guard-rails and timber posts. All costs for renovating the material must be included in the rate tendered under payment item M440.07.

(iii) Re-erection

The guard-rails shall be erected in the positions as indicated and all the removed material suitable for re-use and as much supplementary new material as may be necessary shall be used. Re-erection shall be as specified for new guard-rails, including fixing the retro-reflective plates.

(c) Re-alignment of existing guard-rails

The Engineer may require that the horizontal and vertical alignments of existing guard-rail lines be improved.

Some of the soil around the guard-rail post shall be removed to loosen the posts prior to correcting the alignments. The raising of guard-rails to the required height is best done by using hydraulic jacks at the posts. The soil left in the post hole shall then be thoroughly rammed in underneath the end of the post to keep the post at the correct height above the shoulder. Before the jacks are removed the remainder of the backfilling shall be carried out as described for new guard-rails.

M4403 ACCEPTANCE CRITERIA

All guard-rail posts shall be rigid and vertical and the guard-rail shall be firmly fixed to the post.

The completed guard-rail shall have a neat appearance and shall not show any visible deviation from the required line and grade.

The guard-rails shall overlap in the direction of traffic and the endwings bolted firmly on top of the guard-rail.

#### M4404 MATERIALS

##### (a) Guard-rails

Guard-rails shall comply with the requirements of SABS 1350 and shall be supplied together with all bolts, nuts, washers and fixing materials required including the bolts for fixing the guard-rails to the posts. The length of the guard-rail will be measured according to its effective length equal to 3,81m.

Galvanising of guard-rails, bolts, nuts and washers shall comply with SABS 763.

##### (b) Guard-rail posts

###### (i) Timber posts

Timber posts shall be supplied in lengths as shown on the drawings and shall comply with the requirements of SABS 457 and shall carry the SABS mark.

Posts shall be shaped and drilled as shown on the drawings and shall have a top diameter of not less than 150mm or more than 230mm. The posts shall not exhibit excessive cracking and posts which in the opinion of the Engineer, exhibit a degree of cracking that would render them unfit for service during a much shorter than normal life shall not be used.

Timber posts and spacer blocks shall be treated in accordance with SABS requirements for timber preservation. New timber posts and spacer blocks shall be treated with a creosote preservative.

Posts shall not be sawn, drilled or shaped after treatment. Where, however, the cutting of posts is unavoidable the Engineer may permit the required length to be cut off from the bottom of the post, provided that the exposed area is subsequently thoroughly treated with creosote.

###### (ii) Other guard-rail posts

Normally only timber posts shall be used for supporting the guard-rails but under certain circumstances other types of posts may be required. The type and size of other posts shall be as shown on drawings.

##### (c) Guard-rail reflectors

V-shaped reflective plates shall be manufactured from 1.5mm thick mild steel plate to the dimensions shown on the drawings. When supplied with the galvanised guard-rails, they shall also be galvanised and when supplied with painted guard-rails, they shall be finished in white baked enamel. The outer surface shall be coated with Engineering-grade retro-reflective material, which complies with the provisions of CKS 191 in the colours shown on the drawings. Holes for fixing shall be drilled before the reflective plates are galvanised or painted.

#### M4405 INSTALLATION AND REPAIRING OF WIRE ROPE SAFETY FENCE

Wire rope safety fence shall be erected at locations as directed by the Engineer.



The erection of the wire rope safety fence shall be completely erected as shown on the drawings and set true to time and level so that the wire rope safety fence will be at the required height above the level of the road shoulder.

The wire rope safety fence must meet the requirement for road safety barriers set out in the European CEN Standards (Comité Européen de Normalisation).

The wire rope fence must fulfill the requirements of the impact tests as described in EN 1317, Road Restraint System with a containment level of N1.

## M4406 MEASUREMENT AND PAYMENT

### M4400 GUARD-RAIL ERECTION AND MAINTENANCE

<u>Item</u>		<u>Unit</u>
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M440.01	Supply and erection of new galvanised guard-rails	metre (m)
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The unit of measurement shall be the effective metre of guard-rail erected in position excluding curved guard-rails and end units.

The tendered rates shall include full compensation for furnishing all materials and labour and for galvanising and erecting the guard-rail complete with posts, spacer blocks, bolts, nuts, washers and reinforcing plates.

<u>Item</u>		<u>Unit</u>
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M440.02	Supply and erection of new galvanised curved guard-rails factory bent to a radius of less than 45,0m	metre (m)
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The unit of measurement shall be the effective metre of curved guard-rail erected in position and measured in place.

The tendered rates shall include full compensation for furnishing all materials and labour and for galvanising and erecting the guard-rail complete with posts, spacer blocks, bolts, nuts, washers and reinforcing plates.

<u>Item</u>		<u>Unit</u>
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M440.03	Extra over for erection of guard-rail posts	
	(a) Additional timber posts for payment item M440.01, M440.02	number (No)
	(b) Backfilling guard-rail post with soilcrete	number (No)
	(c) Backfilling guard-rail post with concrete	number (No)

The unit of measurement for subitem M440.03 (a) shall be the number of additional guard-rail posts erected in position and measured in place. The tendered rate shall include full compensation for furnishing and erecting guard-rail posts complete with spacer blocks, bolts, nuts, washers, and reinforcing plates.

The unit of measurement for subitem M440.03 (b) and (c) shall be the number of guard-rail posts backfilled with soilcrete or concrete. The tendered rate shall include full compensation for provision of soilcrete or concrete for backfilling to guard-rail posts as instructed by the Engineer or as detailed on drawings.

<u>Item</u>		<u>Unit</u>
M440.04	End units	
(a)	End wings	number (No)
(b)	Terminal sections in accordance with the drawings where single guard-rail sections are used	number (No)
(c)	Terminal sections in accordance with the drawings where double guard-rail sections are used	number (No)

The unit of measurement shall be the number of end units of each type erected.

The tendered rates shall include full compensation for all labour, constructional equipment and material required for installing the end units as shown on the drawings including posts, fittings and the bending of turned-down sections, excavations, concrete, backfilling and the removal of surplus backfilling.

<u>Item</u>		<u>Unit</u>
M440.05	Guard-rail reflectors	number (No)

The unit of measurement shall be the number of guard-rail reflectors installed.

The tendered rate shall include full compensation for supplying all materials and labour required for manufacturing, painting and fixing guard-rail reflectors as specified and as shown on the drawings.

<u>Item</u>		<u>Unit</u>
M440.06	Removal of damaged guard-rails and re-erection of guard-rails with new, recovered or renovated material	
(a)	Guard-rails	metre (m)
(b)	End wings	number (No)
(c)	Terminal sections with single guard-rails	number (No)
(d)	Terminal sections with double guard-rails	number (No)
(e)	Extra over for providing additional guard-rail posts	number (No)

The unit of measurement for sub-item M440.06 (a) shall be the metre of effective length of guard-rails removed and re-erected including the post with spacer blocks, excavating, backfilling the post holes and removing any surplus excavated material.

The unit of measurement for sub-item M440.06 (b), (c) and (d) shall be the number of units removed and re-erected.

The tendered rate shall include full compensation for constructional equipment, labour and tools required to remove the items and re-erecting the guard-rails as specified with new, recovered or renovated material, including loading, transporting between any two points on the site and off-loading the material. The providing of new material shall be paid under item M440.08 and renovating material under M440.07.

The tendered rate shall also include for the loosening of bolts and the adjacent sections of guard-rails in order to adjust their position to accommodate the new or renovated sections of guard-rail.

The unit of measurement for subitem M440.06 (e) shall be the number of additional guard-rail posts erected in position and measured in place. The tendered rate shall include full compensation for furnishing and erecting guard-rail posts complete with spacer blocks, bolts, nuts, washers, and reinforcing plates.

M440.07 Providing of renovated guard-rail material

(a)	Guard-rails	metre (m)
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The unit of measurement for sub-item M440.07 (a) shall be the metre of guard-rail, provided complete with renovated or new post, spacer blocks, bolts, nuts, washers and reinforcing plates measured in accordance with the measurement of the loose guard-rails. The tendered rate shall include full compensation for renovating the material as specified.

The tendered rate shall include full compensation for the work as specified, including the loading, transporting to and from the workshops, off-loading and storing of the material and transporting the material back to site at position of re-erection.

Payment for renovated material will only be made after erection of the renovated material.

<u>Item</u>	<u>Unit</u>
M440.08 Providing of new material required for the re-erection of guard-rails	
(a) Guard-rails (galvanised)	metre (m)
(b) Curved guard-rails	metre (m)
(c) Timber post	number (No)
(d) Steel posts	number (No)
(e) Spacer blocks	number (No)
(f) Guard-rail reflectors	number (No)
(i) Type D1 (A)	number (No)
(ii) Type D1 (B)	number (No)
(g) End wings	number (No)
(h) Terminal sections with single guard-rails	number (No)
(i) Terminal sections with double guard-rails	number (No)

The unit of measurement for sub-item M440.08 (a) and (b) shall be the metre of guard-rail provided, complete with posts, spacer blocks, bolts, nuts, washers and reinforcing plates measured in accordance with the measurements of the loose guard-rail.

The unit of measurement for sub-item M440.08 (c), (d), (e), (f) and (g) shall be the number of additional new items provided, respectively.

The unit of measurement for sub-item M440.08 (h) and (i) shall be the number of new units provided complete with posts, spacer blocks, bolts, nuts, washers and reinforcing plates.

The tendered rates shall include full compensation for supplying all material as specified.

<u>Item</u>	<u>Unit</u>
M440.09      Drilling and blasting holes for guard-rail posts	number (No)

The unit of measurement shall be the number of holes drilled and blasted with explosives in hard material, which cannot be removed by auger.

The tendered rate shall include full compensation for all drilling, explosives, materials, labour and equipment and all incidentals to be incurred for making holes in hard material.

<u>Item</u>	<u>Unit</u>
M440.10      Reinstatement of concrete to guard-rail posts (Class indicated)	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of concrete placed in accordance with the authorised dimensions.

The tendered rate shall include full compensation for procuring and furnishing all materials, mixing, transporting, placing and compaction of the concrete.

<u>Item</u>	<u>Unit</u>
M440.11      Re-alignment of guard-rails	metre (m)

The unit of measurement shall be the metre of guard-rail re-aligned in position, if required, on the instruction of the Engineer.

The tendered rate shall include full compensation for labour, tools, equipment, materials and overheads required for the alignment of guard-rails as specified.

<u>Item</u>	<u>Unit</u>
M440.12      Installation and repair of wire rope safety fence	
(a)      Provisional sum	Provisional sum (Prov sum)
(b)      The Contractor's overhead charges and profit in respect of providing the service	percentage (%)

**SERIES M4000 : ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE**

**SECTION M4500 : DAZZLE SCREEN ERECTION AND REPLACEMENT**

**CONTENTS**

M4501	SCOPE
M4502	EXECUTION OF WORK
M4503	ACCEPTANCE CRITERIA
M4504	MATERIAL
M4505	MEASUREMENT AND PAYMENT

**M4501 SCOPE**

This section covers the supply and erection of dazzle screens where required and the maintenance of existing screens.

**M4502 EXECUTION OF WORK**

**(a) Erection of dazzle screens**

Dazzle screens shall be erected at locations as directed by the Engineer and as detailed on drawings.

Generally dazzle screens are required in the median of dual carriageway roads to prevent excessive or blinding headlight glare from oncoming traffic or where a similar situation exists where two roads pass close to each other, between the two roads.

Metal and timber dazzle screens shall be erected as specified or instructed by the Engineer. Support posts shall be accurately installed to suit the standard length of the screen supplied.

The top of the screen shall follow the general grade of the road and the screen shall be carefully orientated during erection to ensure that the anti-dazzle effect is achieved.

**(b) Reinstatement of damaged screens**

The damaged screen sections and support posts shall be completely removed and disposed of as approved by the Engineer. Only those damaged sections as ordered by the Engineer shall be dismantled.

New material shall be used for the re-erection of the section of dazzle screen removed. The material shall be similar to that in the existing screen line previously constructed.

Re-erection shall be carried out as prescribed for new screens.

**M4503 ACCEPTANCE CRITERIA**

All dazzle screens shall be rigid and vertical and the screens firmly fixed to the supporting posts.

The completed dazzle screen shall have a neat appearance and shall not show any visible deviation from the required line. The top of the screens shall follow the general grade of the road.

M4504 MATERIAL

The metal and timber material for the manufacturing of screens and supporting posts shall comply with the requirements detailed on the drawings and as specified in the project specifications.

M4505 MEASUREMENT AND PAYMENT

M4500 DAZZLE SCREEN ERECTION AND REPLACEMENT

<u>Item</u>	<u>Unit</u>
M450.01 Supply and erection of dazzle screens	
(a) Metal	metre (m)
(b) Timber	metre (m)

The unit of measurement shall be the metre of dazzle screen fixed in position and measured in place as specified or instructed by the Engineer.

The tendered rate shall include full compensation for furnishing all materials and labour, the manufacturing, treating the materials as required, erecting the screens complete with bolts, nuts and markers.

<u>Item</u>	<u>Unit</u>
M450.02 Supply and erection of dazzle screens supporting posts	
(a) Metal	number (No)
(b) Timber	number (No)

The unit of measurement shall be the number of supporting posts erected.

The tendered rates shall include compensation for furnishing all materials and labour, manufacturing, treating the material as required, erecting the posts in position, backfilling the post holes including concrete backfill where required and removing any surplus excavated material.

<u>Item</u>	<u>Unit</u>
M450.03 Removal of damaged dazzle screens and supporting posts	metre (m)

The unit of measurement shall be the metre of actual of screens removed.

The tendered rate shall include full compensation for equipment, labour and tools required to remove the screen sections and posts including loading, transporting to the campsite, and offloading and stacking the material.

New material shall be used for re-erecting screens at the section removed and payment shall be made under the relevant items for erecting new dazzle screens and supporting posts.

**SERIES M4000 : ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE**

**SECTION M4600 : ROAD MARKINGS**

**CONTENTS**

M4601	SCOPE
M4602	MATERIALS
M4603	WEATHER LIMITATIONS
M4604	MECHANICAL EQUIPMENT FOR PAINTING
M4605	SURFACE PREPARATION
M4606	SETTING OUT THE ROAD MARKINGS
M4607	APPLYING THE PAINT
M4608	APPLYING THE RETRO-REFLECTIVE BEADS
M4609	TOLERANCES
M4610	GENERAL
M4611	FAULTY WORKMANSHIP OR MATERIALS
M4612	PROTECTION
M4613	MEASUREMENT AND PAYMENT

**M4601 SCOPE**

This section covers the permanent marking and maintenance of white or yellow painted lines or symbols on the road surface.

Road marking is regarded as specialist work and shall be undertaken by nominated Subcontractors with relevant experience.

**M4602 MATERIALS**

**(a) Plant**

**(i) Road-marking paint**

Road-marking paint shall comply with the requirements of SABS 731-1 for type 1, type 2 or type 4 paint. The no-pick-up time of road marking paint shall comply with the class 1 requirement in accordance with SABS 731-1.

The paint shall be delivered at the site in sealed containers bearing the name of the manufacturer, type of paint and marked in accordance with SABS 731-1.

The viscosity of the paint shall be such that it can be applied without being thinned down.

**(ii) Retro-reflective road-marking paint**

Retro-reflective road-marking paint shall comply with the requirements of CKS 192 and Subclause M4602 (a) (i).

**(iii) Plastic road-marking material**

Plastic road-marking material shall comply with the requirements of BS 3262.

The binder shall be an elasticised synthetic resin and the material shall be reflectorized by mixing 20% by mass Class A glass beads in accordance with BS 6088.

(iv) Colour

The colours to be used shall be bright white, yellow or red.

The colour of the yellow and red paint shall be as specified in SABS 731-1.

(v) The retro-reflective beads shall be glass beads that comply with the requirements for glass beads specified in CKS 192.

The beads shall be delivered to the site in sealed bags, marked with the name of the manufacturer, the batch number and an inspection seal of the SABS, confirming that the beads form part of a lot tested by the SABS and comply with the requirements of CKS 192. Alternatively, the Contractor shall at all times have a SABS certificate on the site, identifying the batches to which the inspection seals apply and certifying that they have been tested by the SABS, and comply with the requirements of CKS 192.

M4603 WEATHER LIMITATIONS

Road-marking paint shall not be applied to a damp surface or at temperatures lower than 10°C, or when, in the opinion of the Engineer, the wind strength is such that it may adversely affect the painting operations.

No road-marking paint may be applied when visibility is dangerously impeded by mist, smoke or smog.

M4604 MECHANICAL EQUIPMENT FOR PAINTING

The equipment shall consist of an apparatus for cleaning the surfaces, a mechanical road-painting machine and all additional hand-operated equipment necessary for completing the work. The mechanical road-marking machine shall be capable of painting at least three lines simultaneously and shall apply the paint to a uniform film thickness at the rates of application specified hereinafter. The machine shall be so designed that it will be capable of painting the road-markings everywhere to a uniform width with sides within the tolerances specified hereinafter, without the paint running, splashing or spattering. The machine shall further be capable of painting lines of different widths by adjusting the spray jets on the machine or by means of additional equipment attached to the machine. The road-marking machine shall be fitted with a device to guide the operator to the centre of the line to be painted. This device shall be used at all times of operation.

The machine shall be capable of spraying at a speed of not less than 5.0km/h, and shall be provided with clearly visible amber warning flashing lights, which shall always be in operation when the machine is on the road.

M4605 SURFACE PREPARATION

Road markings shall be applied to bituminous surfaces only after sufficient time has elapsed to ensure that damage will not be caused to the painted surface by volatiles evaporating from the seal. After completion of the seal, no less than 2 weeks or such longer period as may be directed by the Engineer shall elapse before any road markings shall be applied. However, the Engineer may, in certain cases, require road markings to be painted without waiting for the seal to harden, in which case it shall be done as soon as possible after the instruction has been given.



Before the paint is applied, the surface shall be clean and dry and completely free from any soil, grease, oil, acid or any other material which will be detrimental to the bond between the paint and the surface. The surface where the paint is to be applied shall be properly cleaned by means of watering, brooming or compressed air if required.

Where road markings are to be applied to a concrete pavement, all laitance and loose curing compound shall be removed.

#### M4606 SETTING OUT THE ROAD MARKINGS

The dimensions and positions of road markings shall be as shown on the drawings or as specified in the appropriate statutory provisions and the South African Road Traffic Signs Manual.

The lines, symbols, figures or marks shall be premarked by means of paint spots of the same colour as that of the final lines and marks. These paint spots shall be at such intervals as will ensure that the road markings can be accurately applied, and in no case shall they be more than 1.5m apart. Normally spots of approximately 10mm in diameter should be sufficient.

After spotting, the positions of the proposed road markings such as broken lines and the starting and finishing points of barrier lines shall be indicated on the road. These premarkings shall be approved by the Engineer prior to any painting operations being commenced.

The position and outlines of special markings shall be produced on the finished road in chalk and shall be approved by the Engineer before they are painted. Approved templates may be used on condition that the positioning of the marking is approved by the Engineer before painting is commenced.

#### M4607 APPLYING THE PAINT

The figures, letters, signs, symbols, broken or unbroken lines or other marks shall be painted as shown on the drawings or as directed by the Engineer.

Where the paint is applied by machine, it shall be applied in one layer. Before the road-marking machine is used on the permanent works, the satisfactory operation of the machine shall be demonstrated on a suitable site, which is not part of the permanent works. Adjustments to the machine shall be followed by further testing. Only when the machine has been correctly adjusted and its use has been approved by the Engineer after testing, may the machine be used on the permanent work. The operator shall be experienced in the use of the machine.

After the machine has been satisfactorily adjusted, the rate of application shall be checked and adjusted if necessary before application on a large scale is commenced.

Where two or three lines are required next to each other, the lines shall be applied simultaneously by the same machine. The paint shall be stirred before application in accordance with the manufacturer's instructions. Paint shall be applied without the addition of thinners.

Where, under special circumstances, painting is done by hand, it shall be applied in two layers, and the second layer shall not be applied before the first layer has dried out sufficiently. As most road-marking paint reacts with the bitumen surface of the road, the paint shall be applied with one stroke only of the brush or roller.

Ordinary road marking paint shall be applied at a rate not less than 0.42 litre per m<sup>2</sup> or as directed by the Engineer and proprietary brand paints or plastic road marking materials shall be applied at the rate specified.

Unless otherwise prescribed by the Engineer, the road marking shall be completed before a particular section of the road is opened to traffic. Each layer of paint shall be continuous over the entire area being painted.

#### M4608 APPLYING THE RETRO-REFLECTIVE BEADS

Where retro-reflective paint is required, the retro-reflective beads shall be applied by means of a suitable machine in one continuous operation, immediately after the paint has been applied. The rate of application of the beads shall be at least 0.8kg per litre of paint or such other rate as may be directed by the Engineer. Machines, which apply the beads by means of gravity only, shall not be used. The beads shall be sprayed onto the paint layer by means of a pressure sprayer.

Additional surface reflectorization of plastic road markings shall be applied at the rate and by means of the methods specified.

#### M4609 TOLERANCES

Road markings shall be constructed to an accuracy within the tolerances given below:

(a) Width

The width of lines and other markings shall not be less than the specified width, nor shall it exceed the specified width by more than 10mm.

(b) Position

The position of lines, letters, figures, arrows and other markings shall not deviate from the true or existing position by more than 100mm in the longitudinal and 20mm in the transverse direction.

(c) Alignment of markings

The alignment of the edges of longitudinal lines shall not deviate from the true alignment by more than 10mm in 15m.

When an unbroken line and a broken line are painted alongside each other, the beginning and the end of the unbroken line shall coincide with the beginning of one broken line and the end of another broken line. When existing lines are painted, the new markings shall not deviate more than 100mm in the longitudinal direction nor 10mm in the transverse direction from the existing marking.

The alignment of the roadstuds shall not deviate from the true alignment by more than 10mm and shall be positioned so that the reflective faces are within 5° of a right angle to the centre line of the road.

(d) Broken lines

The length of segments of broken longitudinal lines shall not be shorter than the specified length or deviate by more than 150mm from the specified length.

#### M4610 GENERAL

In broken lines the length of segments and the gap between segments shall be as indicated on the drawings. If these lengths are altered by the Engineer, the ratio of the lengths of the painted section to the length of the gap between painted sections shall remain the same.

Lines on curves, whether broken or unbroken, shall not consist of chords but shall follow the correct radius.

Where plastic road-marking material is used, the manufacturer shall produce an approved guarantee as specified in the Project Specifications.

Where indicated by the Engineer, the Contractor shall remove existing painted markings from the existing surfaces by means of sand blasting or as ordered by the Engineer. Suitable precautions shall be taken to avoid damage to nearby vehicles or other property during the sand blasting process. The use of black paint or chemical paint remover to obliterate existing markings will not be permitted, except where it is ordered by the Engineer as a temporary measure.

#### M4611 FAULTY WORKMANSHIP OR MATERIALS

If any material which does not comply with the requirements is delivered to the site, or is used in the works, or if any work of an unacceptable quality is carried out, such material or work shall be removed, replaced or repaired as required by the Engineer at the Contractor's own cost.

Rejected road markings and paint which has been splashed or dripped onto the pavement, kerbs, structures or other such surfaces, shall be removed by the Contractor, at his own cost, in an approved manner so that the markings or split paint will now show up at all.

The Contractor shall rectify in an acceptable manner and at own cost, all markings that do not comply with the specified requirements, without necessarily having to be told to do so by the Engineer.

While work is in progress, tests shall be carried out on materials and/or the quality of work to ensure compliance with the specified requirements. The sampling methods are specified in SABS 731-1:1995 under the appropriate sampling and testing methods. The sampling methods described in TMH5 shall be followed where applicable.

The installation as well as the road studs shall be guaranteed for at least 12 months and the Contractor shall replace defects or losses, at his own cost. A maximum of 2% losses will be permitted save that if three and more successive studs are lost from the same line within the 12 month guarantee period they shall be replaced by the Contractor, at his own cost, within 1 month of the date of a written instruction from the Engineer.

#### M4612 PROTECTION

After the paint has been applied, the road markings shall be protected against damage by traffic or other causes. The Contractor shall be responsible for erecting, placing and removing all warning boards, flags, cones, barricades and other protective measures which may be necessary in terms of any statutory provisions and/or as may be recommended in the South African Road Traffic Signs Manual Chapter 13.

Traffic cones shall not be smaller than 750mm in height and shall be placed on the road not further than 48m apart. Cones shall not be removed before the paint on the road has hardened to such an extent that it will not be damaged by traffic. All marks on the road caused by traffic driving over wet paint shall be removed by the Contractor at his own cost.

#### M4613 MEASUREMENT AND PAYMENT

##### M4600 ROAD MARKINGS

<u>Item</u>	<u>Unit</u>
M460.01 Road-marking paint:	
(a) White lines (broken or unbroken) (width of line indicated)	kilometre (km)
(b) Yellow lines (broken or unbroken) (width of line indicated)	kilometre (km)

(c)	Red lines (broken or unbroken) (width of line indicated)	kilometre (km)
(d)	White lettering and symbols	square metre (m <sup>2</sup> )
(e)	Yellow lettering and symbols	square metre (m <sup>2</sup> )
(f)	Transverse lines, painted island and arrestor bed markings (any colour)	square metre (m <sup>2</sup> )
(g)	Kerb markings (any colour)	square metre (m <sup>2</sup> )

<u>Item</u>	<u>Unit</u>
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M460.02 Retro-reflective road-marking paint:

(a)	White lines (broken or unbroken) (width of line indicated)	kilometre (km)
(b)	Yellow lines (broken or unbroken) (width of line indicated)	kilometre (km)
(c)	Red lines (broken or unbroken) (width of line indicated)	kilometre (km)
(d)	White lettering and symbols	square metre (m <sup>2</sup> )
(e)	Yellow lettering and symbols	square metre (m <sup>2</sup> )
(f)	Transverse lines, painted island and arrestor bed markings (any colour)	square metre (m <sup>2</sup> )

<u>Item</u>	<u>Unit</u>
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M460.03 Hot-melt plastic road-marking material (particulars stated):

(a)	White lines (broken or unbroken) (width of line indicated)	kilometre (km)
(b)	Yellow lines (broken or unbroken) (width of line indicated)	kilometre (km)
(c)	Red lines (broken or unbroken) (width of line indicated)	kilometre (km)
(d)	White lettering and symbols	square metre (m <sup>2</sup> )
(e)	Yellow lettering and symbols	square metre (m <sup>2</sup> )
(f)	Transverse lines, painted island and arrestor bed markings (any colour)	square metre (m <sup>2</sup> )

The unit of measurement for painting the lines shall be a kilometre of each specified width of line and the quantity paid for shall be the actual length of line painted in accordance with the instructions of the Engineer, excluding the length of gaps in broken lines.

The unit of measurement for painting the lettering, symbols, transverse lines or painted island and arrestor bed markings shall be a square metre, and the quantity to be paid for shall be the actual surface area of lettering, symbols or transverse lines, painted island and arrestor bed

markings completed in accordance with the instructions of the Engineer.

The tendered rate per kilometre or per square metre as the case may be for painting the road markings shall include full compensation for procuring and furnishing all material, including the retro-reflective beads in the case of retro-reflective paint, and the necessary equipment, and for painting, protecting and maintenance as specified, including the setting-out of lettering, symbols and transverse lines, painted island and arrestor bed markings, but excluding setting out and premarking the lines.

<u>Item</u>	<u>Unit</u>
M460.04      Setting out and pre-marking the lines (excluding traffic-island markings, lettering and symbols)	kilometre (km)

The unit of measurement for setting out lines shall be the kilometre of lines set out and marked. Where two or three lines are to be painted next to each other and where the centre to centre distance between adjacent lines does not exceed 500mm, the setting-out of lines shall be measured only once.

The tendered rate shall include full compensation for setting out and premarking the lines as specified, including all materials.

<u>Item</u>	<u>Unit</u>
M460.05      Removal of existing, temporary or permanent road markings by:	
(a)              Sandblasting	square metre (m <sup>2</sup> )
(b)              Overpainting as temporary measure	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of road marking removed or obliterated.

The tendered rate shall include full compensation for the necessary equipment, labour and materials, for any specific protection measures, accommodation of traffic and the cleaning of the area of all dust, all as specified.

<u>Item</u>	<u>Unit</u>
M460.06      Provisional sum for road-markings:	
(a)              Provisional sum	provisional sum (Prov Sum)
(b)              The Contractor's overhead charges and profit in respect of sub-item M460.06(a)	percentage (%)

Measurement and payment shall be in accordance with the provisions of Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage is a percentage of the amount actually spent under sub-item M460.06(a), which shall include full compensation for the overhead charges and profit of the Contractor.

**SERIES M4000 : ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE**

**SECTION M4700 : MAINTENANCE OF LAY-BYES AND REST AREAS**

**CONTENTS**

M4701	SCOPE
M4702	EXECUTION OF WORK
M4703	ACCOMMODATION OF TRAFFIC
M4704	MEASUREMENT AND PAYMENT

**M4701 SCOPE**

This section covers the work in connection with the maintenance of lay-byes and rest areas.

**M4702 EXECUTION OF WORK**

The detail and specification will be supplied by the Engineer for the maintenance of lay-byes and rest areas.

**M4703 ACCOMMODATION OF TRAFFIC**

The cost of the accommodation of traffic for this section is included in the provisional sum of sub-item M470.01 (a).

**M4704 MEASUREMENT AND PAYMENT**

**M4700 MAINTENANCE OF LAY-BYES AND REST AREAS**

<u>Item</u>	<u>Unit</u>
M470.01 Maintenance of lay-byes and rest areas	
(a) Provisional Sum	provisional sum (Prov Sum)
(b) The Contractor's overhead charges and profit in respect of sub-item M470.01 (a)	Percentage (%)

Payment shall be made in accordance with Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999.

The tendered percentage for sub-item M470.01 (b) is a percentage of the amount actually spent. The percentage shall include for the overhead charges and profit of the Contractor for the maintenance of lay-byes and rest areas.

**SERIES M5000 : PROTECTION WORK**

**SECTION M5100 : GENERAL EROSION PROTECTION**

**CONTENTS**

M5101	SCOPE
M5102	EXECUTION OF WORK
M5103	ACCEPTANCE CRITERIA
M5104	MATERIALS
M5105	MEASUREMENT AND PAYMENT

**M5101 SCOPE**

This section covers all work in connection with the construction of protective covering on exposed surfaces where required, as well as maintenance of existing protective covering.

**M5102 EXECUTION OF WORK**

Protective covering shall be constructed where directed by the Engineer.

Any of the following types of protective covering may be required and the construction thereof shall be in accordance with the specifications, drawings and the Engineer's instructions.

- Stone pitching
- Block paving
- Stone masonry walls
- Concrete grass blocks
- Concrete pitching
- Riprap

**(a) Preparation work**

The area for each type of protective covering shall be prepared as shown on the drawings and as described in the Project Specification before constructing the protective covering. Generally the areas shall be prepared by excavating, shaping and trimming and by thoroughly compacting the area by handramming or a small hand compactor to prevent subsequent settlement. For certain protective work a trench is to be excavated as directed by the Engineer along the toe of any slope to be protected.

If so instructed by the Engineer, the surface of the prepared area shall be treated with suitably registered non-selective pre-emergence pesticides for the control of all plant species. The chemical used will be one that has very limited movement in the soil with a residual action of between 3 to 6 months dependant on soil types. Care must be taken that areas outside of the prepared area are not affected by the chemical application.

For erosion protection such as Stone pitching Method 2 where grass may be planted between spaces, no initial treatment of the ground should be done. The Engineer may issue an instruction for the application of a selective herbicide for the control of broadleaf weeds on completion of the task if required.

The Contractor's attention is drawn to the requirement that pesticides may only be applied by duly registered, competent Contractors in possession of a current Pest Control certificate for the use and application of herbicides for weed control (limitation restrictions will not be accepted other than Industrial Application) as supplied by the National Department of Agriculture.

Where necessary, the application of insecticides for the control of ants / termites may be deemed necessary by the Engineer. Should an instruction be received for their application the following applies: The Contractor's attention is drawn to the requirement that pesticides may only be applied by duly registered, competent Contractors in possession of a current Pest Control certificate for the use and application of insecticides for either structural pest control or wood preservation.

For both vegetation and ant control the following applies: The registered Contractor shall be at the site of application at all times during spraying and ensure that no damage is caused to other plants inside or adjacent to the treated areas as a consequence of the application. Application shall not be carried out in high winds or wet weather.

The following chemicals may not be used:

- Agents of an explosive, flammable, volatile or corrosive nature
- Sodium chlorate
- Volatile low hormone type herbicides
- Agents which are not registered in the Republic of South Africa

The Contractor shall state the brand names of the herbicides and insecticides, on which the tendered rate is based on which shall be subject to the approval of the Engineer, prior to the application thereof.

The chemical should be strictly applied at the rate recommended by the manufacturer.

(b)

#### Stone pitching

##### (i) Plain stone pitching

###### Method 1

The stones shall be laid with their longitudinal areas at right angles to the slope and with staggered joints. The stones shall be well rammed into the bank or surface and the spaces between the larger stone shall be filled with spalls of approved pitching stone securely rammed into place.

###### Method 2

The technique and requirements laid down for Method 1 shall apply except in the following aspects.

- No small stones or spalls shall be used to fill in spaces between larger stones.
- Simultaneously with the placing of stones, topsoil shall be introduced between individual stones and sufficiently rammed as to provide a firm bonded structure. The topsoil shall be provided to the full depth of the stone pitching at any point.
- Rooted grass or tufts of grass shall then be planted between stones and watered immediately and copiously and thereafter at regular intervals until the grass has been established.



(c) Grouted stone pitching

This work shall be done as described for plain pitching except that the spaces between the stones shall be filled with cement grout consisting of one part cement to every six parts of sand. The stone shall be clean and the grout placed in a continuous operation ensuring that all spaces and voids are completely filled.

The grouted pitching shall be cured with wet sacking or other approved wet cover for a period of not less than four days and shall not be subjected to loading until adequate strength has been developed.

Where required weepholes shall be formed in the pitching.

(d) Wired-and-grouted stone pitching

Pitching shall be held in position at the bottom and top with wire nets with 150mm mesh. The bottom net with the wire ties at 600mm distances projecting upwards shall first be placed over the surface. After the stone has been placed in accordance with the requirements for plain pitching the top net shall be placed and drawn tightly over the stone course and securely fastened to the wire ties. The entire area of wired pitching shall then be grouted in accordance with the requirements for grouted pitching.

(e) Grouted pitching on a concrete bed

The concrete bed (15MPa concrete) with a thickness of at least 75mm shall be placed first. The stone pitching shall be stones with a minimum dimension of 200mm and shall be laid while the concrete is still fresh. Openings between the stones shall be filled with cement grout as described for grouted stone pitching.

Curing shall be carried out as described for grouted stone pitching.

(f) Riprap

Riprap shall consist of a course or courses of large rock placed on bank slopes and toes in stream and riverbeds and at other localities where protection of this type may be required.

The perimeter of riprap areas shall be protected by the construction of either rock-filled trenches, walls or other structures as may be required.

(i) Packed riprap

Packed riprap shall be constructed from rocks placed individually to stagger the joints and so as to be firmly bedded. The spaces between larger stone shall be filled with spalls or smaller stone securely rammed into place. On unlined surfaces the rock shall always be laid in long horizontal strips starting from the bottom.

(ii) Dumped riprap

Dumped riprap shall be constructed by dumping the stone on the prepared surface, spreading it by bulldozer or other suitable earthmoving equipment and trimming it to the required lines and levels. The material shall be placed in a manner that will prevent the segregation of the smaller and larger stones and the top layer shall be tight with a minimum of voids.

(iii) Filter bed

The filter bed shall consist of a layer or layers of permeable material placed on the prepared surface to the required thickness and each layer shall be finished to an even surface and thickness. Compaction of previous material will not be required. Care shall be taken not to mix the various grades of filter material neither to disturb material already placed when subsequent layers or riprap are being placed.

When the use of synthetic-fibre fabric is required, the material shall be placed on the prepared surface or on the filter bed depending on the instructions. The overlap between adjacent sheets shall be 150mm unless otherwise specified. Care shall be taken not to damage the filter fabric when subsequent layers are being placed, neither to expose the filter fabric to the sun for periods exceeding three days before it is covered up.

(g) Stone masonry walls

Stone masonry walls shall be either plain packed stonewalls with dry joints or mortared walls with stones bedded in cement mortar.

The minimum mass of each stone used shall be 1kg and its minimum dimensions 75mm. Unless otherwise directed by the Engineer stone shall be obtained from a commercial source.

(i) Plain packed stone walls

A foundation trench shall be excavated to the depth indicated by the Engineer and large selected stone shall be used for the foundation layer. Stones shall be laid individually with the largest dimension in the horizontal plane and with staggered joints. The spaces between the larger stones shall be filled with spalls securely rammed into place. The top and ends of the wall shall be neatly finished with selected copingstones.

(ii) Cement-mortared stone walls

The walling shall be constructed as specified for plain packed stone walls with the exception that the stones shall be clean and wetted and set in a 6:1 sand: cement mortar. The mortar shall be flush pointed to the satisfaction of the Engineer who may require a capping and end treatment of the same mortar.

The walling shall be kept moist for a minimum period of four days after completion.

(h) Segmental block paving

Unless otherwise instructed by the Engineer the underlying layer shall be compacted before laying the paving blocks. The Contractor shall bring the top 150mm of the in situ material to optimum moisture content, then compact the layer and when tested with a dynamic cone penetrometer (DCP) the average penetration recorded after 5 blows shall not exceed 50mm. The full depth of the layer shall be tested.

(i) Sand bedding

A layer of sand to the uncompacted thickness required by the Engineer shall be accurately placed on top of the prepared surface and accurately floated so as to achieve the correct level to the pavement after compaction.

(ii) Laying of paving blocks

The pattern for laying shall be that as shown on the drawings or directed by the Engineer. Unbroken blocks shall first be laid and filler pieces, neatly sawn, afterwards. The joints between blocks shall be between 2mm and 6mm and the top faces of the blocks shall be flush.

After the paving blocks have been laid, the pavement shall be compacted by two passes of a suitable vibratory-plate compactor operating at a frequency of 65-100Hz and a low amplitude. Its plate surface shall be 0.2m<sup>2</sup> - 0.4m<sup>2</sup> and shall develop a centrifugal force of 7 - 16kN.

After compaction, joint sand shall be spread and brushed into the joints until the joints have been properly filled. Surplus sand shall be brushed off and the pavement shall then be subjected to two further passes by the plate vibrator.

(iii) Edge beams

Concrete edge beams or any such other edge supports shall be constructed onto the supporting layer in accordance with the details shown on the drawings, and shall be constructed and left to cure before any paving blocks are laid.

(iv) Paving blocks for sidewalks

Paving blocks for sidewalks shall be laid in the same way as that described for paving blocks, also on a bed of sand but the joints shall be filled with a 6:1 sand: cement instead.

(v) Concrete grass blocks

Concrete grass blocks shall have the size specified or shown on the drawings. The holes in the blocks shall be filled with topsoil and grassed with grass cuttings or hydroseeding.

(i) Cast *in situ* concrete pitching

The areas for cast in situ concrete pitching shall be trimmed and prepared as described for block paving. The areas shall also be treated with vegetation destroyer and ant poison according to the instructions of the manufacturers.

Prior to placing the concrete the surface shall be watered and kept damp until the concrete has been placed. The type of concrete used shall unless otherwise specified, be Class 20 and the concrete shall be accurately laid in alternate panels to the lines and levels indicated, after which the remaining panels shall be suitably placed. The concrete shall be thoroughly compacted and finished to Class U2 surface finish.

Where required concrete edge beams shall be constructed as described for paving blocks.

The concrete pitching shall be cured for at least seven days and no traffic shall be allowed to move across the pitching before the specified 28-day strength has been reached.

(j) Repairs to damaged existing protective covering

The removal and reconstruction of damaged protective covering shall be carried out where ordered by the Engineer.

Protective covering shall be removed to the extent and depth ordered by the Engineer. The reconstruction shall be carried out with the material removed, if suitable, and supplemented with new material where required.

M5103 ACCEPTANCE CRITERIA

The various items shall be constructed neatly to the dimensions shown on the drawings and within the specified dimensional and alignment tolerances.

M5104 MATERIALS

(a) Stone

- (i) Stone for pitching shall be sound and durable without any stone less than 200mm minimum dimension, except that smaller pieces or spalls may be used for filling spaces between the larger stones. The shape of the stone shall be so as to form a stable protective layer of the required thickness.

All stone for use in pitching work shall be obtained from a commercial source approved by the Engineer.

- (ii) Stone for riprap shall be hard quarry stone not susceptible to disintegration or excessive weathering on exposure to the atmosphere or water.

The required size of the stone will depend on the "critical mass" specified in the Project Specifications.

(b) Cement

Cement shall be either common cement or masonry cement, which complies with the requirement of SABS ENV197-1 and ENV413-1.

(c) Sand

- (i) Sand for concrete

Sand for concrete, cement slurry and cement mortar shall comply with the requirements of SABS 1083.

- (ii) Sand for bedding

Sand for bedding used for paving blocks shall not contain any deleterious impurities and shall comply with the grading requirements as specified in the Project Specifications.

- (iii) Sand used for being brushed into joints between pavement blocks shall all pass through a 1.18mm sieve and between 10 and 50 per cent of it shall pass through an 0.075mm sieve.

(d) Paving blocks

Paving blocks shall comply with the requirements of SABS 1058 for Class 25 paving blocks where paving blocks are made of concrete, and bricks used as paving blocks shall be facebrick units which shall comply with the requirements of SABS 227. Engineering units may also be used instead of facebrick units.

The surface texture and colour of all units shall be uniform. Concrete blocks shall be interlocking or rectangular blocks, depending on whichever has been specified in the Schedule of Quantities or in the Project Specifications.

Paving blocks for sidewalks shall be square fabricated concrete blocks, 450mm x 450mm in size and fabricated from Class 30 concrete. The upper surface shall have an approved pattern to provide proper skid resistance.

Concrete grass blocks shall consist of concrete slabs of the dimensions shown on the drawings with openings through the slab totalling at best 20% of the surface area.

(e) Concrete

The class of concrete to be used in concrete work shall be that indicated on the drawings or specified in the Project Specifications.

(f) Wire

Wire for wired stone pitching shall consist of 4.0mm diameter galvanised wire, which complies with the requirements of SABS 675.

(g) Permeable material for filter layer

Permeable material for filter layers shall comply with the requirements specified in the Project Specifications.

(h) Synthetic-fibre filter fabric

Synthetic-fibre filter fabric shall be of the grade and type specified in the Project Specifications.

M5105 MEASUREMENT AND PAYMENT

M5100 GENERAL EROSION PROTECTION

<u>Item</u>	<u>Unit</u>
M510.01 Stone pitching	
(a) Plain pitching	
(i) Method 1	square metre (m <sup>2</sup> )
(ii) Method 2	square metre (m <sup>2</sup> )
(b) Grouted pitching	square metre (m <sup>2</sup> )
(c) Wired-and-grouted pitching	square metre (m <sup>2</sup> )
(d) Grouted pitching on a concrete bed (total thickness indicated)	square metre (m <sup>2</sup> )

The unit of measurement for pitching shall be the square metre of each type of pitching in place.

The tendered rate for each type of stone pitching shall include full compensation for furnishing all materials, compacting and trimming the excavated surfaces, forming and cleaning the weepholes and for all other work necessary for completing the pitching as specified. The tendered rate for grouted stone pitching on a concrete bed shall also include full compensation for the concrete bed.

<u>Item</u>	<u>Unit</u>
M510.02 Riprap	
(a) Packed riprap (critical mass of stone indicated)	cubic metre (m <sup>3</sup> )

(b)	Dumped riprap (critical mass of stone indicated)	cubic metre (m <sup>3</sup> )
(c)	Filter backing	
(i)	Crushed stone	cubic metre (m <sup>3</sup> )
(ii)	Filter sand	cubic metre (m <sup>3</sup> )
(d)	Synthetic-fibre filter fabric (type, class and grade stated)	square metre (m <sup>2</sup> )

The unit of measurement for riprap and filter layer shall be the cubic metre of riprap and filter layer in place. The unit of measurement for synthetic filter fabric shall be the square metre of filter fabric laid as specified including overlaps.

The tendered rates shall include full compensation for preparing the surfaces and for furnishing, transporting, handling and placing of riprap or filter layers. The rate tendered for the filter fabric shall include full compensation for procuring and furnishing the filter fabric and for laying it as specified, including wastage.

<u>Item</u>		<u>Unit</u>
M510.03	Stone masonry walls	
(a)	Plain packed stone	cubic metre (m <sup>3</sup> )
(b)	Cement-mortared stone walls	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of actual walling constructed.

The tendered rate for each type of stone wall shall include full compensation for furnishing all materials, trimming the areas, and placing the stone and cement-mortared masonry for completing the walls in accordance with the specifications.

<u>Item</u>		<u>Unit</u>
M510.04	Concrete pitching and block paving	
(a)	Cast in situ concrete pitching (Class of concrete and thickness of pitching indicated)	square metre (m <sup>2</sup> )
(b)	Segmented block paving (type and thickness indicated)	square metre (m <sup>2</sup> )
(c)	Prefabricated concrete grass blocks	square metre (m <sup>2</sup> )
(d)	Prefabricated concrete paving blocks for sidewalk pavement (thickness indicated)	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of each type constructed.

The tendered rates shall include full compensation for furnishing all materials, all excavation, compacting and trimming all the excavated areas providing a sand bedding, laying concrete grass blocks including topsoil and grassing, constructing concrete pitching, including normal formwork and the shaping of surfaces and for all other work necessary for completing the work as specified.

<u>Item</u>	<u>Unit</u>
M510.05      Concrete edge beams	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of concrete in edge beams constructed as instructed.

The tendered rate shall include full compensation for furnishing all material and labour including formwork as necessary, placing concrete and shaping all surfaces and all excavations required.

<u>Item</u>	<u>Unit</u>
M510.06      Foundation trenches	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of material excavated for trenches irrespective of the class or depth of material. The quantity shall be calculated according to the dimensions shown on the drawings or instructed by the Engineer.

The tendered rate shall include full compensation for the excavation of the foundation trenches complete as shown on the drawings or as directed by the Engineer.

<u>Item</u>	<u>Unit</u>
M510.07      Provision of vegetation destroyer and ant poison	

- |                                     |           |
|-------------------------------------|-----------|
| (a)      Herbicide                  |           |
| (i)    Selective (specify name)     | litre (l) |
| (ii)   Non selective (specify name) | litre (l) |
| (b)      Ant poison                 |           |
| (i)    Specify brand name           | litre (l) |

The unit of measurement shall be the litre of material applied at the manufacturer's recommendation.

The tendered rates shall include full compensation for providing the material and all labour and equipment required for spraying the material at the required rate of application.

**SERIES M5000 : PROTECTION WORK**

**SECTION M5200 : GABION PROTECTION**

**CONTENTS**

M5201	SCOPE
M5202	EXECUTION OF WORK
M5203	MATERIALS
M5204	ACCEPTANCE CRITERIA
M5205	MEASUREMENT AND PAYMENT

**M5201 SCOPE**

This section covers the construction of gabion baskets for retaining walls at structure embankments and unstable slopes and the construction of gabion mattresses in watercourses for scour protection. It includes the maintenance of existing gabion structures.

**M5202 EXECUTION OF WORK**

Gabion baskets and mattresses shall be constructed where directed by the Engineer.

**(a) Preparing the foundation and surface**

The surface on which the gabion cages are to be laid prior to their being filled with rock, shall be levelled to the depth shown on the drawings or as directed by the Engineer so as to provide an even surface. Where required a foundation trench along the toe of the cages shall be excavated to the required dimensions.

**(b) Filter fabric below the cages**

Where indicated on the drawings or ordered by the Engineer, one layer of filter fabric of the type and grade specified shall be placed on the prepared surface prior to the cages being placed. The fabric shall be placed in strips with a minimum overlap of 300mm at the joints, and shall be properly fastened to prevent any movement or slipping while cages are being placed.

**(c) Assembling of cages**

Before assembling, the cages shall be stretched out on a hard flat surface and any kinks stamped out. The method of construction, placing in position, wiring and filling the gabions with rock shall generally be in accordance with the manufacturer's instructions which have been approved by the Engineer; but nevertheless sufficient connecting wires shall be tensioned between the vertical sides of all outer visible cells to prevent the deformation of cages as they are being filled with stone.

It is essential that the corners of gabion cages be securely wired together to provide a uniform structure. Consecutive courses of cages shall be bonded as in brickwork so as to provide the staggering of the vertical joints.

Where necessary to form curves and angles, the mesh and selvedge wires shall be folded and securely bound. Cutting of the mesh and selvedge wires will not be permitted unless authorised by the Engineer.



(d) Rock filling

(i) Gabion baskets

The cages shall be filled in even layers to prevent deformation and bulging. Selected stone of the specified size shall be packed in the visible sides so as to obtain an even-faced finish. Cages shall be filled to just below the level of the wire braces, after which the braces shall be twisted to provide tension.

(ii) Gabion mattresses

The mattresses shall be filled by random stones being packed in the first layer and by selected stones being used for the top layer so as to resemble normal stone pitching.

(e) Repairing existing gabion structures

Repair work to existing gabion structures shall be carried out as directed by the Engineer. It may involve the removal of stone from the cages, the repacking thereof and the placing and tying of new gabion wire mesh.

Equipment and labour required for repair work shall be paid for on a daywork basis under the hourly rates in the daywork schedule. The provision and installing of new gabion mesh shall be paid for under the relevant pay items in this section.

M5203 MATERIALS

(a) Wire

All wire used for making the gabions for tying during construction shall comply with the requirements of SABS 675 for mild-steel wire and shall be galvanised in accordance with the provisions of SABS 675 for Class A heavy galvanised mild-steel wire.

(b) Wire mesh

Wire mesh shall be hexagonally woven mesh in which the joints are formed by each pair of wires being twisted through the three half-turns.

The diameters of the wire and the size of meshes shall be as follows:

Depth of gabion	Mesh Size (mm)	Wire diameter (mm)
0,5m and over	80 x 100	2,5
	100 x 120	2,7
0,2m - 0,3m	80 x 100	2,2

Other combinations of mesh size and wire diameter may be used when specified in the Project Specification.

(c) PVC-coated wire

Whenever gabions with PVC-coated wire are specified, the wire used for gabion mesh and for tying during construction shall be galvanised as specified, supplied with an extruded polyvinyl chloride coating (PVC coating). The average thickness of the PVC coating shall be not less than 0,5mm and the minimum thickness shall be 0,4mm. It shall also be resistant to the harmful effect of normal weather and to being exposed to salt water.

The gabions of PVC-coated wire shall be of an acknowledged make, which shall be subject to approval by the Engineer.

(d) Filter fabric

The filter fabric to be used shall be of the type and grade specified in the Project Specifications.

(e) Rock

Rock used in filling of cages shall be clean, hard unweathered rock fragments obtained from a commercial source which shall be subject to the approval of the Engineer.

No rock fragment shall exceed the maximum size specified for the various gabion cage sizes and at least 85% of the rocks shall be of a size equal to or above the minimum size specified.

M5204 ACCEPTANCE CRITERIA

Each finished gabion structure shall present a neat exposed face true to line and free from bulges in excess of 50mm.

M5205 MEASUREMENT AND PAYMENT

M5200 GABION PROTECTION

<u>Item</u>	<u>Unit</u>
M520.01 Foundation trench excavation and backfilling	
(a) In solid rock (material which requires blasting)	cubic metre (m <sup>3</sup> )
(b) In all other classes of material	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of each class of excavation made in accordance with the authorised dimensions.

The tendered rates shall include full compensation for excavating in each class of material including unavoidable overbreak, the trimming of trenches and compacting the trench inverts, backfilling and compacting the backfill and the disposal of surplus material.

<u>Item</u>	<u>Unit</u>
M520.02 Surface preparation for bedding the gabions	square metre (m <sup>2</sup> )

The unit of measurement for levelling and preparing surfaces for receiving the gabions shall be the square metre to the neat dimensions of revetments, aprons or wall foundations.

The tendered rate shall include full compensation for excavating, filling any cavities with rock and levelling the ground surface so as to be ready for receiving the gabion cages for retaining walls, aprons and revetments.

<u>Item</u>	<u>Unit</u>
M520.03 Gabions	
(a) Gabion baskets (size of basket and mesh indicated)	cubic metre (m <sup>3</sup> )

(b)	Gabion mattresses (depth of mattress, mesh size and diaphragm spacing indicated)	cubic metre (m <sup>3</sup> )
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The unit of measurement shall be the cubic metre of the rock-filled cages and the quantity shall be calculated from the dimensions of the gabions indicated on the drawings or prescribed by the Engineer, irrespective of any deformation or bulging of the completed gabions.

The tendered rates shall include full compensation for supplying all the materials, including rock fill, wire-mesh cages, tying and connecting wires, loading, transporting and off-loading, the assembling and filling of the cages, and any other work necessary for constructing the gabions.

<u>Item</u>	<u>Unit</u>
M520.04      Extra over Item M520.03 for supplying gabions with PVC-coated wire	cubic metre (m <sup>3</sup> )

The tendered rate shall include full compensation for the additional cost, over and above the rate tendered for the relevant item, for supplying PVC-coated gabions and tying wire.

<u>Item</u>	<u>Unit</u>
M520.05      Filter fabric (type and grade indicated)	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of area covered with filter fabric placed in position.

The tendered rate shall include full compensation for supplying the filter fabric, cutting waste, placing, joining, overlapping and securing the material in position.

**SERIES M6000 : VEGETATION MAINTENANCE**

**SECTION M6100 : CONTROLLING VEGETATION GROWTH: MOWING AND CUTTING**

**CONTENTS**

M6101	SCOPE
M6102	EXECUTION OF WORK
M6103	ACCEPTANCE CRITERIA
M6104	EQUIPMENT
M6105	PENALTIES
M6106	MEASUREMENT AND PAYMENT

**M6101 SCOPE**

This section covers the control of planted or natural grasses and vegetation by means of mechanical mowers or by hand on single and dual carriageway roads. It includes the removal of the grass cuttings by means of mechanical balers or by hand.

**M6102 EXECUTION OF WORK**

As part of the mowing and cutting operation all declared vegetation and undesirable vegetation (of which the stem girth is less than 151mm) shall be taken to be one and the same thing. Mowing of grass shall be classified into shoulder mowing and general mowing.

**(a) Shoulder mowing**

Shoulder mowing along main carriageway (National Route) shall include the following:

**(i) Strips adjacent to the road surface**

The widths of the strips are:

- Gravel shoulders: Gravel shoulders and side slopes over a width of 3,0m as shown on the drawings (3m from edge of gravel shoulder).
- Surfaced shoulders: Gravel round-off and side slopes over a width of 3,0m as shown on the drawings (3m from edge of surface).

The width of the strip shall be measured from the outer edge of the surfacing, except where there is a concrete side drain adjacent to the edge of the surfacing. In the latter case it shall be measured from the outer edge of the concrete side drain. The grass between the surfacing and concrete side drain shall also be cut as shown on the drawings.

**(ii) Grassed side drains**

Any grassed or gravel side drains and any area between either concrete/tarred or concrete/tarred surfaces falling within the adjacent strips.

**(iii) Culvert inlet and outlet areas including the removal of all cuttings to avoid creating blockages.**

- (iv) The median.

The full width of the median (if it exists).

- (v) Interchanges

The area of an interchange is defined as the full road reserve starting and ending from the furthest points of intersection of the outside edges of the ramp and the main carriageway. This includes the full reserve width of the cross road extending up to the limits of the South African National Roads Agency responsibility, or as indicated with the marker plates or pegs on site.

Shoulder mowing at interchanges shall consist of the mowing of strips adjacent to the edges of all ramps, cross roads, sight triangles and carriageways within the area of the interchange as indicated on the drawings.

- (b) General mowing

General mowing along main carriageway (National Route), including interchanges, covers all areas inside the road reserve including the road reserve of cross roads up to a distance extending up to the limits of the South African National Roads Agency responsibility, or as indicated on the drawings.

- (c) Designated areas

The Contractor shall cut all grass and weeds in designated areas in the road reserve, such as the sight triangles at intersections, the areas in front of and around road signs and kilometre reference markers, and all other areas as specified or as shown on the drawings. The dimensions and location of the areas in which the grass and weeds are to be cut shall be as shown on the drawings. The Contractor shall control all vegetation growth around signs in such a way necessary to prevent any damage to the signs due to veld fires. The Contractor will replace all signs damaged due to veld fires at the Contractor's own cost.

- (d) Requirements

The following shall apply for any mowing and cutting operation:

- (i) The grass shall be mowed to a height of not less than 50mm and not more than 150mm measured above the surrounding ground level and removed.
- (ii) No distinction will be made between grass on flat areas or on slopes.
- (iii) The Contractor shall be responsible for baling or the collection and disposal of all grass cuttings by machine or by hand. Grass cuttings may be left in sparsely covered areas but shall be evenly distributed as directed by the Engineer.
- (iv) The road pavement shall be kept clear of grass spreading over the edges.
- (v) Concrete side drains shall be cut clear of grass spreading over the edges or growing in the joints. After removal of the grass, the concrete surfaces shall be swept clean of grass.
- (vi) The removal of the bales or heaps of grass shall be undertaken at the same rate of progress as the baling operation. Bales or heaps of grass shall not be left in drainage channels or be left in the road reserve for a period exceeding two days, or be left in the road reserve over weekends,

or be left in the road reserve closer than 4m from the edge of the tarred surface.

- (vii) Certain areas around road signs, trees, large obstructions, under guard-rails, at wingwalls and abutments, on steep slopes and in drainage trenches and dongas will not lend themselves to normal machine cutting and these areas shall be cut using alternative methods. The finished work shall provide a neat and evenly cut appearance with no isolated tufts of grass left remaining.
- (viii) Cutting by hand, cleaning and removal of grass cuttings shall keep up with the mechanical mowing. At no time shall the mechanical mowers be allowed to be more than 7km ahead of the labour finishing behind.
- (ix) Grass flattened by implements during the mowing and cutting process shall be cut by hand.
- (x) No grass or other plant cuttings may be burnt in the road reserve or in the immediate vicinity of any road.

#### M6103 ACCEPTANCE CRITERIA

##### (a) Designated areas

The height of the grass shall not be less than 50mm and not more than 450mm at any time during the maintenance period. The area of each sight triangle, kilometre reference marker boards and road signs will be evaluated individually when monthly inspections are done. The Contractor will not be allowed more than 2 of the abovementioned areas in any 3km section of road inspected for non-compliance with the above.

##### (b) General and shoulder mowing

Vegetation shall be cut to the required height and mowing done evenly without abrupt changes or breaks at and within the period specified. Areas shall be left neat and tidy with all vegetation cutting removed.

#### M6104 EQUIPMENT

The mechanical mowers shall be in good order and fitted with a boom mounted flail cutting attachment to cut vegetation on slopes. The mower shall be fitted with two high intensity amber flashing lights, which shall be visible from both the front and the rear of the vehicle.

Safety precautions must be taken to ensure that the mower does not project or propel any stone or object, which may cause injury to persons or damage to public vehicles.

Provision shall be made for one flagman to accompany each motorised mower. The flagmen shall thoroughly be trained to carry out the flagging procedure required for the mowing activity to ensure that the travelling public respects warnings given by them.

The mower shall as far as possible always operate in the direction of traffic flow and the flagman shall maintain a distance of approximately 150m behind the mower.

#### M6105 INSPECTION OF MOWING FOR PAYMENT

Inspection for the designated areas to be based on the following:

- Inspection of the designated areas will be monthly.
- The road will be broken up into 3km sections.

- The total length of the road will be divided by 20 to determine the number of sections to be inspected. A maximum of 10 sections and a minimum of 4 will be inspected and the positions will be chosen randomly.
- If the section does not comply with the acceptance criteria that section fails.
- The Contractor will be penalised by the number of failed sections multiplied by the penalty amount specified in the Project Specifications.

## M6106 MEASUREMENT AND PAYMENT

### M6100 GRASS CUTTING: SHOULDER AND GENERAL MOWING

<u>Item</u>	<u>Unit</u>
M610.01 Shoulder mowing and removal of grass cuttings	
(a) Reserve with dual carriageway (State section and km distance incl. interchanges)	number (No)
(b) Reserve with single carriageway (State section and km distance incl. interchanges)	number (No)

The unit of measurement shall be the number of shoulder mow and removal of grass cuttings operation for section as specified.

The tendered rate shall include full compensation for furnishing all equipment and labour for each mow and removal operation, regardless of whether the grass is cut by machine or manual labour, and shall include all costs for the picking up and disposal of grass cuttings, all as specified in Clause M6102.

No separate payment will be made for cutting grass on steep or rocky slopes. The tendered rate shall also include for removal of cut grass from all open drains of growth as specified in this section and the cutting of grass around road signs.

<u>Item</u>	<u>Unit</u>
M610.02 General mowing and removal of grass cuttings	
(a) Reserve with dual carriageway (State section and km distance incl. interchanges)	number (No)
(b) Reserve with single carriageway (State section and km distance incl. interchanges)	number (No)

The unit of measurement shall be the number of general mow and removal of grass cuttings operation for section as specified.

The tendered rate shall include full compensation for furnishing all equipment and labour for each mow and removal operation, regardless of whether the grass is cut by machine or manual labour, and shall include all costs for the picking up and disposal of grass cuttings, all as specified in Clause M6102.

No separate payment will be made for cutting grass on steep or rocky slopes. The tendered rate shall also include for removal of cut grass from all open drains of growth as specified in this section and the cutting of grass around road signs.

The width of cut for general mowing shall always be from full road reserve width, irrespective whether it is a single carriageway, dual carriageway or single carriageway in a future dual carriageway road reserve.

<u>Item</u>		<u>Unit</u>
M610.03	Additional interchange mowing and removal of grass cuttings on instructions by the Engineer	
(a)	Shoulder mowing (State interchanges)	number (No)
(b)	General mowing (State interchanges)	number (No)

The unit of measurement for sub-item M610.03 (a) and (b) shall be the number of interchanges mowed and baled on instruction of the Engineer in addition to the Contractor's obligation under payment sub-item M610.01 (a) and (b) and sub-item M610.02 (a) and (b).

The tendered rate shall include full compensation for furnishing all equipment and labour for each mow and removal operation, regardless of whether the grass is cut by machine or manual labour, and shall include all costs for the picking up and disposal of grass cuttings, all as specified in Clause M6102.

No separate payment will be made for cutting grass on steep or rocky slopes. The tendered rate shall also include for removal of cut grass from all open drains of growth as specified in this section and the cutting of grass around road signs.

The width of cut for general mowing shall always be from fence to fence, irrespective whether it is a single carriageway, dual carriageway or single carriageway in a future dual carriageway road reserve.

#### M6110 GRASS CUTTING: DESIGNATED AREAS

<u>Item</u>		<u>Unit</u>
M611.01	Cutting of designated areas	
(a)	Sight triangle at intersection, roadsigns and marker boards	month

The monthly rate shall include full compensation for furnishing all equipment and labour, for all mow and removal operations regardless of the quantities, or whether the grass is cut by machine or manual labour, and shall include all costs for picking up and disposal of grass cuttings as specified.

No separate payment will be made for cutting grass on steep or rocky slopes.

The tendered rate shall include full compensation for furnishing all plant, equipment and labour for each mow operation, regardless of whether the grass is cut by machine or manual labour, all as specified.

<u>Item</u>		<u>Unit</u>
M611.02	Additional cutting of areas	
(a)	Any area on instruction from the Engineer	area (m <sup>2</sup> )
(b)	Cut next to fence line (indicate width)	kilometre (km)
(c)	1m cut either side of concrete drains	kilometre (km)

The unit of measurement for sub-items M611.02 (a) is the area cut in accordance with the drawings, on instruction of the Engineer.



The unit of measure for sub-item M611.02 (b) and (c) is the actual kilometre of strips cut. For sub-item M611.02 (c) cut on either side of the drain will be measured along the centre line of the drain.

No separate payment will be made for cutting grass on steep or rocky slopes.

The tendered rate shall include full compensation for furnishing all plant, equipment and labour for each mow operation, regardless of whether the grass is cut by machine or manual labour, all as specified.

**SERIES M6000 : VEGETATION MAINTENANCE**

**SECTION M6200 : CHEMICAL CONTROL OF VEGETATION AND ERADICATION OF UNDESIRABLE VEGETATION**

**CONTENTS**

M6201	SCOPE
M6202	EXECUTION OF THE WORK
M6203	ACCEPTANCE CRITERIA
M6204	EQUIPMENT
M6205	MEASUREMENT AND PAYMENT

**M6201 SCOPE**

This section covers the chemical eradication of declared and undesirable vegetation as well as the chemical control of vegetation growth, through the application of herbicide.

**M6202 EXECUTION OF WORK**

The eradication of undesired vegetation (as described in M6302 (a)) and control of vegetation growth shall be executed annually in the Spring or Summer (up to early Autumn in coastal areas) during the period when the vegetation to be killed, is growing strongly.

The Contractor's attention is drawn to the requirement that herbicides may only be applied by duly registered, competent Contractors in possession of an AVCASA certificate. Proof of such registration shall be furnished on demand to the Engineer.

The registered Contractor shall be at the site of application at all times during spraying and ensure that no damage is caused to other plants inside or adjacent to the treated areas as a consequence of the application of herbicides.

Application shall not be carried out in high winds or wet weather.

The following herbicides may not be used:

- Agents of an explosive, flammable, volatile or corrosive nature
- Sodium chlorate
- Volatile low hormone type herbicides
- Agents which are not registered in the Republic of South Africa

The Contractor shall state the brand names of the herbicides, on which the tendered rate is based, which shall be subject to the approval of the Engineer, prior to the application thereof.

The agent shall be guaranteed to kill at least 90% of the unwanted growth with one application and shall have a residual effect, which controls the growth of such vegetation effectively.

The herbicide should be strictly applied at the rate recommended by the manufacturer.

**(a) Control of vegetation growth**

Subject to written approval by the Engineer beforehand, spraying shall be executed in the following designated areas as shown on the drawings:

- (i) Shoulder weedspray shall involve the spraying of a 300mm wide strip of herbicide, 100mm of which will be on the surfaced shoulder and 200mm on the gravel shoulder.
- (ii) Vegetation under guard-rails shall be controlled by spraying under the guard-rail to a minimum width of 500mm;
- (iii) Openings, cracks and joints between the road pavement and concrete as well as between paving stones and concrete blocks;
- (iv) Up to a minimum distance around the poles at kilometre markers, road signs and guard-rail posts as indicated on the drawings;
- (v) Between the road reserve fence and a neighbouring solid wall. Here the Contractor may use only contact herbicides which are absorbed by the leaves and which do not have a detrimental effect on the soil;
- (vi) On block paved areas adjacent to concrete median barriers or steel guard-rails. These areas may have slopes to 1:1 grades.
- (vii) On joints and cracks of concrete drainage channels.

The type of herbicide to be used, the correct spray rates, the method of application and when applied shall be as specified in the Project Specifications.

(b) The Eradication of undesirable vegetation

The eradication of declared and undesirable vegetation shall take place in the road reserve during the contract period over the whole length of the sections of road involved, and may include localised patches of noxious weeds, invader plants and other undesired vegetation.

Felled tree stumps must be treated with a herbicide immediately after cutting to prevent regrowth.

The Contractor shall ensure that no damage whatsoever is caused to any plants inside or adjacent to the areas treated as a consequence of the application of the herbicides, either during or after application. This also includes areas outside the road reserve.

The type of weedkiller to be used, the correct application rates and when applied shall be as specified and according to the manufacturer's instructions and approved by the Engineer.

M6203 ACCEPTANCE CRITERIA

Eradication of undesired vegetation shall be carried out as specified and to the satisfaction of the Engineer. The herbicide shall be applied at the correct rate to prevent re-growth and the application confined to the undesired vegetation.

Areas shall be left neat and tidy and all vegetation cuttings removed unless otherwise instructed.

M6204 EQUIPMENT

Vegetation shall be eradicated using knapsacks or portable weedspray machines.

It is important that the equipment be in good working condition. The equipment shall distribute the herbicide evenly without spilling. The nozzle shall be able to move close to the ground in order to prevent mist spray blowing away and killing plants which have to be maintained. The equipment shall also be safe for the workers as well as for the travelling public.

M6205 MEASUREMENT AND PAYMENT

M6200 CHEMICAL CONTROL OF VEGETATION AND ERADICATION OF UNDESIRABLE VEGETATION

<u>Item</u>	<u>Unit</u>
M620.01 Annual chemical control of vegetation and eradication of weeds	
(a) Road reserve with dual carriageway (State section and km distance incl. interchanges)	number (No)
(b) Road reserve with single carriageway (State section and km distance incl. interchanges)	number (No)

The unit of measurement shall be the number of annual control of vegetation and eradication of weeds per section as specified and shall include full compensation for all labour, equipment and material required for control of vegetation and eradication of weeds as specified in the specifications or drawings.

The Contractor is to assess the number of different types of places where application of chemicals will be required and to make provision accordingly for the fluctuating chemical demand per section of road.

The tendered rate shall include full compensation for the supply of chemicals, equipment and labour for the spraying of the chemical liquids in accordance with the manufacturer's specifications.

The tendered rates shall be fully inclusive of any costs arising from restricted working conditions due to the nature of the site or traffic flow.

Payment will be made as follows:

- (a) 60% will be payable when visible results are obtained
- (b) The remaining 40% will be payable when at least 90% of the treated vegetation has been controlled to the opinion of the Engineer.

<u>Item</u>	<u>Unit</u>
M620.02 Additional chemical control of vegetation and eradication of undesirable vegetation on instruction from the Engineer	
(a) Isolated areas	square metre (m <sup>2</sup> )
(b) Dense areas (areas more than 20% infested)	hectare (ha)

The unit of measurement for sub-item M620.02 (a) shall be the square metre of additional control of weeds and shall include full compensation for all labour, equipment and material required for control of vegetation and eradication of weeds.

The unit of measurement for sub-item M620.02 (b) shall be the hectare of additional control of vegetation and eradication of weeds. The areas will be measured by dense hectare (the percentage of infestation per hectare). For payment the rate per hectare will be that multiplied by the percentage infestation. The tendered rate shall also include full compensation for all labour, equipment and material required for control of vegetation and eradication of weeds.

The Contractor is to assess the number of different types of places where application of chemicals will be required and to make provision accordingly for the fluctuating chemical demand per section of road.

The tendered rate shall include full compensation for the supply of chemicals, equipment and labour for the spraying of the chemical liquids in accordance with the manufacturer's specifications.

The tendered rates shall be fully inclusive of any costs arising from restricted working conditions due to the nature of the site or traffic flow.

Payment will be made as follows:

- (a) 60% will be payable when visible results are obtained
- (c) The remaining 40% will be payable when at least 90% of the treated vegetation has been controlled in the opinion of the Engineer.

**SERIES M6000 : VEGETATION MAINTENANCE**

**SECTION M6300 : REMOVAL OF UNDESIRABLE VEGETATION: PHYSICAL ERADICATION**

**CONTENTS**

M6301	SCOPE
M6302	EXECUTION OF WORK
M6303	ACCEPTANCE CRITERIA
M6304	MEASUREMENT AND PAYMENT

**M6301 SCOPE**

This section covers the physical eradication of undesirable vegetation which shall be followed with chemical eradication as included in section M6200 as well as the felling and removal of undesirable trees in the road reserve, bush clearing and the burning of firebreaks.

**M6302 EXECUTION OF WORK**

**(a) Removal of undesirable vegetation**

The Contractor shall remove all noxious weeds, invader plants and other undesirable vegetation in the first two months of the contract period, thereafter it shall be removed annually. Additional clearing may be ordered by the Engineer should the need be determined.

All noxious weeds, invader plants and other undesirable vegetation shall be removed by uprooting and by cutting brush with suitable equipment such as brush cutters, chainsaws or bowsaws.

The sight distance of all signs must be kept clear of all noxious weeds, invader plants, trees and other undesirable vegetation as indicated on the drawings.

For the purposes of this Clause, undesirable plant growth shall include, but not limited to all declared species as listed in category 1 and 2 of the Conservation of Agricultural Resources Act. This list will alter between provinces and note must be taken of this when determining the species to be eradicated. Undesirable plants will not only be those listed under category 1 and 2 but will also include those deemed to be invasive within any identified area or region.

Vegetation growing within 200mm of the road pavement in the case of grassed shoulders shall also be considered as undesirable vegetation growth.

Specific areas requiring to be treated in this manner shall be specified or indicated on the drawings.

All branches and stems shall be cut into manageable sizes for loading and transporting purposes. The removed vegetation shall then be disposed of in a manner approved by the Engineer.

In areas where vegetation has grown out of control, the Contractor shall clear the vegetation by cutting and removal to the designated dumpsite.

The vegetation shall be cut to a height of 50mm - 100mm measured above the surrounding ground level, and removed from the site to a dump site approved by

the Engineer. The cut faces shall be painted with approved herbicide to prevent re-growth.

(b) Tree felling

Tree felling will be executed on those trees not included under M6302 (a). Only those trees as indicated by the Engineer on site shall be cut and removed.

Care shall be taken not to damage overhead services, buildings, structures and fences during the tree felling operations. Guide ropes shall be fixed as high up the tree trunk as possible to ensure that, when strain is exerted on the ropes, the tree drops in the correct position.

A wedge approximately 500mm above ground shall first be cut from the front face of the tree trunk in the direction of fall and while exerting strain on the guide ropes, a horizontal cut on the back face opposite the wedge shall be made.

The remaining stump shall be cut as low down to the ground as possible and herbicide painted on the cut face to prevent re-growth. The felled tree shall be cut in manageable sections for loading and transporting purposes.

(c) Fire breaks

Median and fenceline firebreaks shall be burned at the end of the growing season after the shoulder / general mow. The firebreaks shall be 5m wide. Median firebreaks shall be placed at approximately 200m intervals. Fenceline firebreaks shall be a continuous 5m wide strip adjacent to the fence where required. The burning of a fenceline firebreak shall only be done in areas identified by the Engineer and on direct instruction from the Engineer.

Generally, the burning of median and fenceline firebreaks shall be undertaken when the grass in the median is dry and less than 150mm tall and when there is little or no wind. The grass on both sides of the proposed fire break shall be well wetted to prevent the fire from spreading beyond the demarcated area and workmen with fire beaters or water hoses shall be in attendance to extinguish any runaway fires.

The burning of median and fenceline firebreaks shall be executed under strict-supervision. Any trees, hedge or shrubs adjacent to the firebreak shall be protected during the burning operation against singeing by using damp hessian screens.

Once the burning has been completed, the burnt area shall be doused with water to ensure that no further outbreak of fire will occur. Should a wind pick up during the burning operation, especially one that threatens to blow smoke across the road, all burning operations must cease immediately until suitable conditions return.

Fire warning signs together with any other required temporary road signs shall be erected on both carriageways prior to the burning of any firebreak.

Firebreaks in the form of mowing within the road reserve between fence and road will be only undertaken on instruction from the Engineer. These firebreaks will consist of a 5m wide mow adjacent to the fenceline. All cut plant material shall be removed from site within one week of cutting. This mowing shall occur before assisting adjacent landowners with the burning of firebreaks on their property fenceline.

The Contractor shall indemnify the employer against all proceedings, claims, actions, damages and costs which may arise from or be related to the absence of improper control of fires during the burning of fire breaks.

In addition to the above the Contractor shall assist the landowners who wish to burn firebreaks within their property along the length of the roadway.

The Contractor shall conform to the regulations as set out in the VFFA of 1998 – Act No. 101.

All work executed in assisting the landowners with burning firebreaks as required by the Veld and Forest Fire Act is to be instructed by the Engineer and will be paid for under Dayworks.

#### M6303 ACCEPTANCE CRITERIA

Eradication of undesirable vegetation shall be carried out as prescribed and to the satisfaction of the Engineer.

Areas shall be left neat and tidy and all vegetation cuttings removed unless other means of disposal are agreed with by the Engineer.

#### M6304 MEASUREMENT AND PAYMENT

Tenderers shall note that rates tendered for items in this section shall be inclusive for all the necessary safety measures or additional labour, equipment and materials required for work adjacent to median barriers or within urban freeway medians.

##### M6300 REMOVAL OF UNDESIRABLE VEGETATION: PHYSICAL ERADICATION

<u>Item</u>	<u>Unit</u>
M630.01 Eradication of undesirable vegetation, tree felling and cutting branches	
(a) Initial eradication (State section and km distance incl. interchanges)	lump sum (LS)
(b) Annual eradication (State section and km distance incl. interchanges)	number (No)

The lump sum tendered for sub-item M630.01 (a) is for full compensation of the initial eradication of undesirable vegetation, tree felling and cutting branches as specified.

The unit of measurement for sub-item M630.01 (b), is the number of annual eradication per section and the rate tendered is for full compensation of all eradication of undesirable vegetation, tree felling and cutting branches required as specified.

The tendered rates shall include full compensation for all labour and equipment necessary for the cutting of vegetation to a height of 50mm – 100mm measured above the surrounding ground level, cutting of trees and branches including cutting trunks and branches into manageable sizes and painting all cut faces with herbicide where necessary, loading, off loading and spreading and hauling to an approved dump site.

<u>Item</u>	<u>Unit</u>
M630.02 Tree felling on instruction from the Engineer	
(a) Girth 151mm to 500mm	number (No)
(b) Girth 501mm to 1 000mm	number (No)
(c) Girth 1 001mm to 2 000mm	number (No)
(d) Girth 2 001mm to 4 000mm	number (No)



(e)	Larger than 4 000mm	number (No)
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The unit of measurement shall be the number of trees felled within the above girth ranges measured at 1.0m above ground.

The tendered rates shall include full compensation for providing all plant, equipment and labour required for cutting down trees, including cutting trunks and branches into manageable sizes for transporting purposes, and painting the cut faces with herbicide where required, and for loading the material.

<u>Item</u>		<u>Unit</u>
M630.03	Burning of fire breaks per operation	
(a)	5m wide fire breaks in median (State section and km distance incl. interchanges)	number (No)
(b)	5m wide fire breaks from road reserve fence to road reserve fence (excluding median fire breaks) (State section and km distance incl. interchanges)	number (No)
(c)	5m wide fire breaks next to road reserve fence	kilometre (km)

The unit of measurement shall for sub-item M630.03 (a) and (b) be the number of fire break operations on sections as specified and shall include full compensation for all equipment, transport and labour required to burn the fire breaks at specified intervals, including protective measures against fire damage to established shrubs and hedges and for providing and erecting fire warning signs on both carriageways.

The unit of measurement for sub-item M630.03 (c) shall be the actual kilometre of 5m wide fire break executed as specified and shall include full compensation for all equipment, transport and labour required to burn the fire breaks at specified intervals, including protective measures against fire damage to established shrubs and hedges and for providing and erecting fire warning signs on both carriageways.

<u>Item</u>		<u>Unit</u>
M630.04	Additional eradication of undesired vegetation ordered by the Engineer	hectare (ha)

The unit of measurement shall be the hectare of additional eradication of undesired vegetation. The areas will be measured by dense hectare (the percentage of infestation per hectare). For payment the rate per hectare will be multiplied by the percentage infestation. The tendered rate shall also include full compensation for all labour and equipment necessary for the cutting of vegetation to a height of 50mm – 100mm measured above the surrounding ground level, cutting of trees and branches including cutting trunks and branches into manageable sizes and painting all cut faces with herbicide where necessary, loading, off loading and spreading and hauling to an approved dump site.

**SERIES M6000 : VEGETATION MAINTENANCE**

**SECTION M6400 : MAINTENANCE AND ESTABLISHMENT OF PLANTS, TREES AND SHRUBS**

**CONTENTS**

M6401	SCOPE
M6402	EXECUTION OF WORK
M6403	ACCEPTANCE CRITERIA
M6404	MEASUREMENT AND PAYMENT

**M6401 SCOPE**

This section covers the maintenance of established hedges, shrubs, trees and grassing. It includes the replacement of damaged or missing plants and the planting of additional plants where required and trimming of hedges and shrubs.

**M6402 EXECUTION OF WORK**

Maintenance of grassing, trees, shrubs and plants and the planting of additional plants shall be carried out on written instruction of the Engineer.

**(a) Hoeing around trees and shrubs**

The Contractor shall hoe around trees and shrubs within the road reserve before the grass is cut, and shall take care not to damage or disturb the roots of these trees and shrubs. Light hoeing shall be done around designated newly planted and young trees and shrubs to protect them from fire and from being smothered by weeds.

Hoeing will also include the loosening of soil, the forming of ponds around young shrubs and the removal of all debris to approved dumpsites.

Hoeing shall be done to such a depth that it does not damage the roots and stems of young plants.

**(b) Fertilising of established plants**

Fertilising shall be carried out on the instruction of the Engineer. Unless otherwise specified, 2:3:2(22) + Zn fertiliser shall be used, spread and raked in around the plant at a rate of one eighth of a litre per plant. The plants shall then be watered to soak the fertiliser into the soil to prevent the loss of nitrogen from the fertiliser.

**(c) Positioning of trees, shrubs and hedge plants**

(i) Trees and shrubs shall be planted at locations as detailed by the Engineer and shall include the replacement of dead, damaged or missing plantings;

(ii) Hedge plants shall be planted 1,5m apart or as directed by the Engineer and shall include the replacement of dead, damaged or missing plantings.

- (iii) When the carriageways are at different levels, the hedge plants shall be planted 2m from the edge of the shoulder on the high side of the median or as directed by the Engineer.
- (iv) Where the road curves, hedge plants shall be planted on the inside of the median centre line.
- (v) Where the carriageways are at different levels as well as on a curve, the hedge plants shall be planted as in (iii);
- (vi) At freeway crossings over roads or rivers, shrubs shall be planted in positions as directed by the Engineer.
- (vii) At the headwalls of culverts or similar structures trees and/or shrubs shall be planted to indicate the positions of these structures. The locations for planting the plants shall be as shown on the drawings or as directed by the Engineer.
- (viii) Care shall be taken not to obscure traffic signs by plants.
- (ix) Trees shall not be planted closer than 10m from the yellow line on the outside shoulder.

(d) Preparing plant holes

Unless otherwise directed by the Engineer, holes shall be placed and prepared as follows for new plants:

- (i) Holes for hedge plants and shrubs shall be at least 500mm square by 600mm deep and spaced 1.5m apart for hedge plants.
- (ii) Holes for trees shall be at least 600mm square by 700mm deep.
- (iii) The excavated holes shall be backfilled with selected and approved topsoil thoroughly mixed with an equal quantity of compost. The required quantity of the specified fertiliser shall be 200ml per shrub hole and 500ml per tree hole.
- (iv) The holes shall be thoroughly watered before plants are planted. Where the soil is poorly drained, 150mm of crushed stone shall be placed at the bottom of the hole before it is filled with soil.

(e) Planting

Before plants are removed from their containers for planting, they shall be well watered. Once removed from their containers, their rootball will be loosened slightly before planting.

Directly after having been planted, each plant shall be well watered and if the soil has settled, additional soil shall be added to bring the soil in the hole to within 150mm of the ground surface, so as to ensure that sufficient water can be retained in the hole around the plant.

All trees shall be tied to a suitable treated timber stake firmly planted in the ground. The stake shall have a minimum diameter of 35mm and its maximum length shall be 1.5m above ground level.

After planting, the ground surface around the plant shall be covered with straw or grass or any other type of mulch to minimise evaporation.

(g) Time for planting

Trees and shrubs shall be planted as far, as is practicable during periods of the year most likely to produce best growing results.

(h) New plants

Plants shall be the variety and size as specified in the Project Specifications.

Plants shall be healthy, shapely and well rooted. Roots shall not show any evidence of having been restricted or deformed at any time. Plants shall grow well and be free from insect pests and diseases. Plants shall be fully maintained and watered before planting and any losses of plants on account of the lack of care, also where they are diseased, shall be replaced at the Contractor's own expense. The plants shall be hardened off and be exposed to direct sunlight for at least six months prior to planting.

(i) Watering

During the period of maintenance, which shall be a maximum of twelve months or up to the end of the contract period, whichever comes first, after completion of the actual planting of trees, shrubs and hedges, the Contractor shall be responsible for watering the trees, shrubs and hedges and keeping the plants free from weeds and pests.

(j) Trimming of Hedge Plants

Hedges shall be trimmed back between the minimum and maximum width and heights as indicated on the drawings. The sides shall be tapered as indicated on the drawings.

The Contractor shall trim all hedges to the recommended size annually during the winter months.

M6403 ACCEPTANCE CRITERIA

Maintenance work shall be executed as prescribed and to the satisfaction of the Engineer.

Every new hedge plant, tree or shrub which is not healthy or shows unsatisfactory growth shall be replaced by the Contractor at the Contractor's own expense within one month of having been notified by the Engineer.

M6404 MEASUREMENT AND PAYMENT

M6400 MAINTENANCE AND ESTABLISHMENT OF PLANTS, TREES AND SHRUBS

<u>Item</u>	<u>Unit</u>
M640.01 Hoeing around trees and shrubs	
(a) Trees/shrubs up to 20m apart	number (No)
(b) Trees/shrubs between 20m and 100m apart	number (No)
(c) Trees/shrubs more than 100m apart	number (No)

The unit of measurement is the number of trees and shrubs around which hoeing is necessary on instruction by the Engineer. A distinction is however made between different tree and shrub spacings.



<u>Item</u>	<u>Unit</u>
M640.06      Watering trees, shrubs and grass	kilolitre (kl)
<p>The unit of measurement shall be the kilolitre of water used.</p> <p>The tendered rate shall include full compensation for obtaining, transporting and applying the water.</p> <p>Trees, shrubs and grass shall be watered when instructed, at the rate of application of the water as required by the Engineer. The Contractor shall keep a careful record of the quantity used by him and shall submit such information to the Engineer on a daily basis.</p>	

**SERIES M6000 : VEGETATION MAINTENANCE**

**SECTION M6500 : ESTABLISHMENT OF GRASS**

**CONTENTS**

M6501	SCOPE
M6502	MATERIALS
M6503	EXECUTION OF WORK
M6504	ACCEPTANCE CRITERIA
M6505	MEASUREMENT AND PAYMENT

**M6501 SCOPE**

This section covers the establishment and subsequent maintenance of grassed areas through various methods as well as the preparation of areas for grassing.

**M6502 MATERIALS**

**(a) Fertiliser/soil-improvement material**

The type of fertiliser/soil-improvement material to be used shall be one or more of the following types and any other type of fertiliser/soil-improvement material specified in the Project Specifications or prescribed by the Engineer. The rate of application shall be determined by a detailed soil analysis.

- (i) Soil-improvement materials such as dolomitic lime, basic slag, gypsum, superphosphate and agricultural lime.
- (ii) Fertilisers such as limestone ammonium nitrate, 2:3:2 (22) and 3:2:1 (25).
- (iii) Liquid fertiliser may be used as prescribed by the Engineer.

**(b) Grass runners**

Grass runners shall be fresh cuttings harvested on the day of planting of an approved type of grass with sufficient root material to ensure good growth. This method will only be used on soils that show no potential for erosion.

**(c) Grass seeds**

Only fresh certified seed shall be used and the types of seeds in the seed mixture shall be as specified in the Project Specifications or as ordered by the Engineer.

Mixing the various types of grass seeds for obtaining the prescribed grass-seed mixture shall be done on the site in the presence of the Engineer. Storing and identifying the grass seeds and the grass-seed mixtures on the site shall be the responsibility of the Contractor. The composition of the seed mixture shall be as specified by the Engineer.

**(d) Grass sods**

Grass sods shall be either nursery-grown or veld sods as described below. Both types shall be harvested, delivered, planted and watered within 36 hours unless otherwise authorised by the Engineer. The grass sods shall be free from noxious weeds and diseases. Sods obtained from a nursery shall be in moist soil not less

than 30mm deep, and sods taken from the veld in moist soil not less than 50mm deep. Sods shall also measure a minimum of 400mm in width and 500mm length and shall retain the minimum dimensions on placement.

(i) Nursery-grown sods

These sods shall be as specified in the Project Specifications, unless the Engineer has approved the use of an alternative. The grass shall have been grown specifically for sod purposes, mown regularly and cared for to provide an approved uniformity to the satisfaction of the Engineer. It shall be well watered before harvesting and be harvested by special machines manufactured for this purpose to ensure an even depth of cut with sufficient root material and soil. The top 30mm of topsoil shall be lifted with the sod to ensure that the root structure of the sod remains covered with topsoil at all times prior to the replanting thereof.

(ii) Veld sods

These sods may be obtained from approved areas within or near the site where a suitable type and density of grass and type of soil are found. The area from which the sods are to be harvested from shall be mowed regularly and cared for to provide suitable sods to the satisfaction of the Engineer. The top 50mm of topsoil shall be lifted with the veld sod to ensure that the root structure of the veld sod remains covered with topsoil at all times prior to the replanting thereof.

(e) Topsoil

Topsoil shall preferably consist of fertile loamy soil, obtained from areas with good soil coverage of natural vegetation, preferably grasses. It shall be free from deleterious matter such as large roots, stones, refuse, stiff or heavy clays and the seeds of noxious weeds, which will adversely affect its suitability for grass being planted.

Topsoil shall be obtained from designated borrow areas or from sources approved by the Engineer. The Engineer shall communicate the Engineer's requirements to the Contractor regarding the quantity of topsoil, which is necessary, and the areas for which it shall be selected and removed by the Contractor. Unless otherwise specified, topsoil shall be taken from not deeper than 400mm for the surface. If the Contractor fails to conserve the topsoil as instructed, the Contractor shall obtain suitable substitute material from other sources at no extra cost to the Employer.

Where so specified, the Contractor shall procure and furnish topsoil from the Contractor's own source outside the site, after the Engineer has approved sources.

Topsoil shall be stockpiled in separate loose heaps as tipped from the trucks and shall be stockpiled in heaps not exceeding 2.0m in height. Care shall be taken to prevent the compaction of the topsoil in any way, especially by trucks being driven over such material.

If topsoil is to be stockpiled for longer than 2 months the stockpiles must be seeded with a suitable grass seed. Stockpiles must be kept weed free at all times.

(f) Manure

Manure shall, unless the Engineer has approved another type, shall be old, sweated pure kraal manure free from soil, weed seeds or other undesirable material. It shall not contain any particles that will not pass through a 50mm screen and shall be approved by the Engineer before being delivered to the site.



(g) Compost

Compost shall be well decayed, friable and free from weed seeds, dust or any other undesirable materials. It shall not contain any particles that will not pass through a 50mm screen and shall be approved by the Engineer prior to delivery to site.

(h) Anti-erosion compound

Anti-erosion compounds may be required and will be applied on instructions from the Engineer.

M6503 EXECUTION OF WORK

Grassing shall be carried out when instructed by the Engineer. It is the intention of the contract to execute the topsoiling, fertilising and grassing operation using labour intensive methods.

(a) Preparing areas for grassing

(i) Trimming

Trimming shall consist of trimming the existing or previously shaped ground to an even surface with the final levels generally following the original surface and drainage remaining effective. Trimming shall be done when instructed by and to the satisfaction of the Engineer. Trimmed surfaces shall be left slightly rough to facilitate a better binding with topsoil or the natural establishing of vegetation.

During trimming, all stones in excess of 50mm in size and all excess material shall be removed. Areas which require grassing shall be trimmed in such a way that, after cultivation and the application of topsoil, the finished surface of the area shall be approximately 30mm below the top of adjacent kerbing, channelling or pavement for nursery sods and 50mm below for veld sods.

(ii) Topsoiling

Where areas to be grassed consist of organically unsuitable material, the surface shall be scarified to a depth of 100mm to ensure a proper bond between the topsoil and the subsoil.

Topsoil shall be placed on the prepared surfaces and trimmed to the uniform thickness required. The topsoil shall be scarified by means of hand raking or light rotavators.

All loose stones exceeding 30mm in size on areas to be mowed by machine and falling within the road reserve and all stones exceeding 150mm in size in other areas shall be removed.

Where the areas to be grassed consist of organically suitable material, the topsoil shall be scarified to a minimum depth of 150mm.

Where soil is too hard to be ploughed with a light tractor, the soil shall be ripped up to a depth of 300mm before it is loosened by plough to a depth of 150mm.

(iii) Fertilising

For all areas to be re-vegetated the Contractor shall, without any additional compensation, have the top 150mm of the prepared surface tested to determine the quantity and type of fertiliser, which will be required for establishing proper growth conditions for the grass. The

Engineer shall be furnished with the test results. Only after approval by the Engineer of the nature and quantity of the fertiliser, its application may be proceeded with. The fertiliser shall be evenly applied over all surfaces where grass is to be planted, and shall then be thoroughly mixed with the soil to a depth of 150mm either mechanically or manually. Where hydro seeding is to be performed, the fertiliser such as limestone ammonium nitrate 2:3:2(22) + Zn may be mixed with anti-erosion compound and water used in hydro seeding.

After an area has been prepared for grassing, the grassing shall be completed before crustification. Where a crust has been formed before grassing is done, the Contractor shall, at the Contractor's own cost, loosen the crust by ploughing to a depth of 150mm.

(iv) Removal of existing vegetation from slopes before sodding

This section covers the removal of all vegetation and other matter on areas such as existing cut and fills slopes, which fall outside the road prism and where the existing topsoil consists of organically suitable material. Where the topsoil is of unsuitable nature the existing grass shall be cut down to a height of not more than 50mm above ground level before topsoil is added.

Removal of all vegetation shall consist of clearing and removal of existing grass, tufts, roots, all other vegetation, rubbish and other objectionable matter including the disposal of all material resulting from this operation. Cavities resulting from this process shall be backfilled with material from the immediate surroundings, shaped and compacted so that all undulations form a smooth curve. The moving of a certain amount of soil or gravel material may be inherent to or unavoidable during the process and no extra payment will be made for this.

The above work shall only be done on the written instruction of the Engineer.

On completion the area shall be further prepared for grassing.

(b) Grassing

(i) Sodding

Areas where sodding is to be reinstated shall be shaped first and a layer of approved topsoil of a maximum of 75mm thickness spread over the areas unless, where suitable soil is present, the Engineer orders the topsoil to be omitted. The areas shall be roughened and thoroughly watered before placing the sods.

Sods shall be butted tightly against each other and where a good fit cannot be obtained any intervening spaces shall be filled with topsoil. On steep slopes, when instructed by the Engineer, the sods shall be held in position by a sufficient number of wooden stakes approximately 300mm long by 20mm in thickness knocked in to a depth of 100mm. The handling of the sods shall not result in the sods losing their approved soil thickness.

Unless otherwise instructed by the Engineer, the sods shall be of the same type as the existing sods. The new sods shall be healthy and well rooted.

The sods shall be watered directly after placing and regularly thereafter to prevent undue drying out.

(ii) Grass runners

The Engineer may order the planting of grass runners to re-establish grass on certain areas.

The areas to be planted shall receive the same treatment before planting as prescribed for sodding.

The type of grass to be used and the spacing between cuttings shall be as specified in the Project Specifications.

Only fresh runners shall be used but not any runners that have been allowed to dry out. The grass shall be watered directly after planting and regularly thereafter to prevent undue drying out.

(iii) Hydro seeding and/or hand sowing

The types and mixtures of seeds to be used shall be as specified in the Project Specifications or, if not so specified therein, shall be agreed on by the Engineer and the Contractor before any seed the Contractor may wish to use is ordered by the Contractor. The Contractor shall be solely responsible for establishing an acceptable grass cover and any approval by the Engineer of seed or seed-mixtures intended for use by the Contractor shall not relieve him of this responsibility.

Hydro seeding shall be carried out with an approved hydro seeding machine at a rate of application of not less than 38kg of seed mixture per hectare, unless otherwise specified in the Project Specifications.

Anti-erosion compounds Verdyol 60 and Verdyol Mulch shall be applied at application rates of 600kg/ha and 1200kg/ha respectively. These application rates may be amended on instructions from the Engineer. These compounds shall be sprayed onto the soil to bind and protect it against erosion.

Where required by the Engineer, sowing shall be done by hand. The seed shall be spread uniformly over the surfaces and then lightly raked into the soil.

(c) Establishing and maintaining the grass

(i) Watering

All sodded and grassed areas shall be watered at regular and frequent intervals to ensure the topsoil remains moist and maintains optimum conditions for growth until the grass has established an acceptable cover. Watering during these periods shall not be paid for but watering carried out on the instruction of the Engineer after these periods shall be paid for under the relevant pay item.

M6504 ACCEPTANCE CRITERIA

All grassed areas shall have an acceptable cover as defined below at both the beginning and the end of the maintenance period.

An acceptable grass cover shall mean that not less than 75% of the area grassed or hydro seeded shall be covered with grass and that no bare patches exceeding 0.25 m<sup>2</sup> in any area of 1,0m x 1,0m shall occur. In the case of sodding, acceptable cover shall mean that the entire area shall be covered with live grass at the end of any period not less than three months after sodding.

The Contractor shall be solely responsible for establishing an acceptable grass cover and for the cost of replanting grass or re-hydro seeding where no acceptable cover has been established. This responsibility will be effective from the expiration of the initial 3 month period allowed for establishing an acceptable cover.

Grassing showing deterioration due to the lack of watering shall be replaced by the Contractor at the Contractor's own cost when instructed by the Engineer.

## M6505 MEASUREMENT AND PAYMENT

### M6500 ESTABLISHMENT OF GRASS

<u>Item</u>	<u>Unit</u>
M650.01 Trimming for grassing	
(a) Machine trimming	square metre (m <sup>2</sup> )
(b) Hand trimming	square metre (m <sup>2</sup> )

The unit of measurement shall be the square metre of area trimmed.

The tendered rates shall include full compensation for trimming the area and loosening the in situ material including the removal of small quantities of surplus material and stones. Payment shall distinguish between machine trimming, which can be reasonably done by motor grader and hand trimming of areas instructed by the Engineer.

<u>Item</u>	<u>Unit</u>
M650.02 Loosening of topsoil	
(a) Ripping	hectare (ha)
(b) Ploughing for loosening topsoil	hectare (ha)

The unit of measurement for ripping shall be the hectare of soil ripped. Only areas ripped on the written instructions of the Engineer shall be measured for payment.

The tendered rate shall include full compensation for ripping, complete as specified.

The unit of measurement for loosening the topsoil by ploughing shall be the hectare of soil loosened and prepared in accordance with the specifications. Only areas loosened by ploughing on the written instructions of the Engineer shall be measured for payment.

The tendered rate shall include full compensation for loosening the topsoil by ploughing, removing stones, levelling and trimming the surface.

<u>Item</u>	<u>Unit</u>
M650.03 Topsoiling (placing)	
(a) Flat areas	cubic metre (m <sup>3</sup> )
(b) Slopes	cubic metre (m <sup>3</sup> )

The unit of measurement shall be the cubic metre of topsoil applied and levelled by hand at the specified thickness or as directed by the Engineer, and compaction by means of 3 pass roller compaction, measured in situ after the topsoil has been placed. Any topsoil placed in excess of the average thickness instructed will not be measured for payment.

The tendered rate shall include full compensation for stockpiling at the designated source, loading and transporting, placing and spreading the topsoil as required including a free-haul of 1.0km, as well as for all hand tools, negotiation and supervision to complete the work on a labour-intensive basis.

<u>Item</u>	<u>Unit</u>
M650.04 Overhaul on topsoil	cubic metre -kilometre (m <sup>3</sup> -km)

The unit of measurement shall be the cubic metre of topsoil, net volume measured in place, multiplied by the average overhaul distance in excess of the free-haul distance of 1,0km.

The tendered rate shall include full compensation for hauling the material in excess of the free-haul distance.

<u>Item</u>	<u>Unit</u>
M650.05 Chemical fertiliser and/or soil improvement material for grassing (types indicated)	ton (t)

The unit of measurement shall be the ton of each type of material ordered and applied.

The tendered rate shall include full compensation for furnishing the fertiliser, transporting it to the point of use, spreading and mixing it into the topsoil, irrespective of the method of application as well as all hand tools, negotiations and supervision required for completion of the work.

<u>Item</u>	<u>Unit</u>
M650.06 Removal of existing vegetation from slopes before sodding	square metre (m <sup>2</sup> )

The unit of measurement for removal of existing vegetation from slopes shall be the square metre, measured to the nearest 10 square metres.

The tendered rate shall include full compensation for labour and equipment necessary for removing all existing vegetation from slopes, shaping and scarifying the slopes as specified in the Project Specifications and all other work necessary prior to the application of topsoil or grass sods.

<u>Item</u>	<u>Unit</u>
M650.07 Grassing	
(a) Grass runners (type of grass indicated)	square metre (m <sup>2</sup> )
(b) Sodding	
(i) Nursery sods (type of grass indicated)	square metre (m <sup>2</sup> )
(ii) Veld sods	square metre (m <sup>2</sup> )
(c) Hydro seeding and hand sowing	
(i) Providing an approved seed mixture for hydro seeding or hand sowing	kilogram (kg)
(ii) Hydro seeding	hectare (ha)
(iii) Hand sowing (labour-intensive)	square metre (m <sup>2</sup> )

(a) Grass runners

The unit of measurement for planting grass runners shall be the square metre of established grass with an acceptable grass cover.

The tendered rate shall include full compensation for furnishing and planting the runners, watering, weeding, and replanting if necessary, and all other incidentals which may be necessary for establishing an acceptable cover and maintaining the grass, except mowing.

(b) Sodding

The unit of measurement for sodding shall be the square metre covered with sods, which has an acceptable cover.

The tendered rates shall include full compensation for procuring, excavating, loading, transporting, off-loading, placing and watering the sods, for replanting dead areas, for watering and weeding the grass, for supplying and placing timber stakes and for all other incidentals, except for mowing, which may be necessary for establishing an acceptable cover, and maintaining the grass. Payment shall distinguish between nursery-grown sods and veld sods obtained from within the road reserve or borrow areas. In the case of veld sods the tendered price shall include levelling-off and trimming areas from which the sods are taken.

(c) Hydro seeding and hand sowing

- (i) The unit of measurement for providing seed shall be the kilogram of seed of the specified seed mixture. The mass of any pulp added shall not be measured.

The tendered rate shall include full compensation for procuring and furnishing the seeds.

- (ii) The unit of measurement for hydro seeding shall be the hectare of grass established by hydro seeding, which has an acceptable cover.

The tendered rate shall include full compensation for furnishing cellulose pulp and mixing it with seed and water and with any anti-erosion compound, if required, applying the mixture, watering, weeding, re-hydro seeding bare patches, and for any other work, except mowing, which may be necessary for establishing an acceptable cover and maintaining the grass.

- (iii) The unit of measurement for hand sowing the grass seeds shall be the square metre of grass with an acceptable covering on surfaces instructed by the Engineer to be hand-sown by means of labour-intensive methods.

The tendered rate shall include full compensation for all labour, materials, equipment, weeding, and all incidentals, which may be necessary for planting the grass seeds and establishing an acceptable grass covering. The tendered rate shall also include full compensation for watering the planted areas until an acceptable grass covering has been established.

**SERIES M7000 : EMERGENCY ASSISTANCE**

**SECTION M7100 : EMERGENCY STANDBY TEAM**

**CONTENTS**

M7101	SCOPE
M7102	EXECUTION OF WORK
M7103	MEASUREMENT AND PAYMENT

**M7101 SCOPE**

This section covers the provision by the Contractor of standby teams to provide emergency assistance for the normalisation of emergency events and emergency earth- and layerworks repair.

**M7102 EXECUTION OF WORK**

**(a) Emergency assistance**

The Engineer may call upon the Contractor's staff for emergency assistance during, as well as outside normal working hours, over weekends, or on public holidays. For this purpose the Contractor shall maintain an emergency standby team, consisting of adequate staff and level of skill, which shall be available for call out at any time. The Contractor shall keep the Engineer informed of the name, address and 24 hours contact telephone number of the supervisor on emergency standby duty who shall have access to any tools, equipment and transport ordered by the Engineer.

**(b) Emergency standby team**

The emergency standby team must at least consist of a supervisor and eight labourers and a light delivery vehicle (LDV). The supervisor's management and skill level must be of such nature as to make informative decisions, effectively organise the team and be able to take the responsibilities inherent in the emergency assistance. The labourers must be able to effectively and efficiently operate the tools and equipment and be prepared to work as a team and accept orders from a higher authority.

The Contractor shall provide at least the number of standby teams as indicated in the Project Specifications. Each team shall be located optimally to minimise the responding time for emergencies.

**(c) Emergency standby equipment**

As a minimum the following tools and equipment shall be available, at any time, with each emergency standby team for emergency assistance:

<b>TABLE M7102/1: EMERGENCY STANDBY EQUIPMENT</b>	
<b>Equipment Requirements Per Team</b>	
<b>Item</b>	<b>Quantity</b>
1 ton LDV with pushbars, cage-work and ramp and trailer	1
Portable battery operated flashing amber warning lights	6
Spot lamps	2
Fire extinguishers (capacity 9 litres)	2
Grass fire fighting equipment (e.g. pole with wet sack)	6
Cattle prod	1
Chainsaw (including all fuel, oils and safety equipment)	1
Bowsaw	1
Axes	2
Bushknives (two with long handles)	4
Block and tackle (minimum strength of 1,5 ton)	1
Metal chain 8mm	10 m
Rope (heavy duty)	2 x 30m
Shovels	3
Spades	3
Post hole digger (for sign posts)	1
Hand soil compactor	1
Forks	2
Rakes	2
Bass brooms	6
Step ladder (self supporting type) (min 2,0 m)	1
Oclansorb or similar	2
150 mm angle grinder	1
Orange medical box	1
5 kva generator with 2 x 500W floodlights	1
Emergency roadsigns, barricades, cones etc	According to drawing
Protective day-glow clothing (reflective jackets, rain suits etc)	For all personnel
Fire fighting trailer (1 000 litre capacity)	1
<b>TOOLS:</b>	
Hammers (wood medium, 4 pound and 14 pound)	3
Crowbar	1
Woodsaw	1
Hacksaw (heavy duty, with spare blades)	1
Adjustable spanners (heavy duty)	2
Screw drivers	-
Pliers	1
Wire cutters	1
Metal file	1
<b>SUNDRIES:</b>	
Bucket (and cloths)	2
Squeegee (with extendable handle)	2
Water containers (20 litres)	2
Gloves (heavy duty)	9 pairs

All of the above-mentioned equipment should be neatly packed into a trailer used specifically for the rendering of emergency assistance.

The trailer which is equipped with the 3,2m by 2,5m wide electronically illuminated high visibility sign shall be fully rigged with the necessary electrical power source and



equipment to illuminate flashing lights fitted at 300mm centres on the perimeters of the TR103 sign and TW336 warning signs and on the perimeter of the 3,2m by 2,5m panel.

The trailer and equipment shall be maintained and be available for use at all times.

Any other safety and emergency equipment that may be ordered by the Engineer shall be paid for under dayworks.

(d) Responding Time

Depending on the seriousness of the event for which emergency assistance is being called for, the emergency standby team shall report for duty where assistance is required, within the specific time, as indicated in the Project Specifications, on the receipt of the instruction. The Contractor shall take this requirements into account when deciding on the site of the Contractor's labourer's accommodation.

Any failure or neglect by the Contractor to comply strictly with the provisions of this specification, or any omission or neglect by the Contractor in adhering to or applying the principles as are described and inherent in this specification, shall be deemed to constitute as a warrant for the Engineer to act in terms of Subclause 8.7 of the FIDIC Conditions of Contract for Construction, 1999.

(e) Communication

The Contractor is to ensure, that communication between the Engineers representative and the Contractor's representative is maintained 24 hours a day. This can be reached by means of the provision of cellular telephones to the responsible persons. The cost of the Contractor's cellular telephone is to be included in section M0300 : Contractor's Establishment on Site and General Obligations and will not be paid for separately.

The Contractor is to ensure that contact persons are available at the relevant contact numbers 24 hours a day.

M7103 MEASUREMENT AND PAYMENT

Payment under this section will only be for maintaining the specified emergency teams and equipment on standby and for the call-out cost thereof. The execution of the work as needed or ordered by the Engineer will be paid for under the relevant sections.

<u>Item</u>	<u>Unit</u>
M7100 EMERGENCY STANDBY TEAM	
M710.01 Emergency standby	
(a) Emergency team on standby	month
(b) Emergency equipment on standby	month
(c) Call-out cost	kilometre (km)

Payment under sub-item M710.01 (a) shall be made for each calendar month that the Contractor maintains the specific emergency team on standby to the satisfaction of the Engineer.

Payment under sub-item M710.01 (b) shall be made for each calendar month that the Contractor maintains the specified emergency equipment on standby to the satisfaction of the Engineer.

Payment under sub-item M710.01 (c) shall be the kilometre travelled to the point of incidents of emergency assistance rendered. The tendered rates shall include full compensation of

transporting the emergency team and equipment to and from the point of incidence. Payment will only be made for the distance travelled in one direction, from the site of accommodation of the labourers, to the point of the incident.

**SERIES M7000 : EMERGENCY MAINTENANCE**

**SECTION M7200 : ALL-EMERGENCY NORMALISATION**

**CONTENTS**

M7201	SCOPE
M7202	EXECUTION OF WORK
M7203	ACCEPTANCE CRITERIA
M7204	MEASUREMENT AND PAYMENT

**M7201 SCOPE**

This section covers the work involved in the normalisation, restoration and safeguarding of dangerous areas resulting from any accidental event in the road reserve.

**M7202 EXECUTION OF WORK**

When called upon by the Engineer, the Contractor shall proceed immediately to the scene of the accidental event, with equipment and material ordered by the Engineer, to normalise, restore or safeguard any dangerous area in order for the safe passage of any traffic using the road.

In the event of accidents, vehicle/s shall not be removed without prior permission from the Engineer or police and before moving any vehicle/s to a safe place, the position of the vehicle/s shall be marked on the road as instructed by the police or incident manager.

In the event of chemical spillage on the road, the affected area shall be covered with sand or other substance as ordered to absorb the spillage. The contaminated sand or substance shall then be broomed or shovelled off the road and if necessary a thin layer of clean sand shall be spread over the road.

**M7203 ACCEPTANCE CRITERIA**

After any accidental event the roadway and road surface shall be normalised, restored or safeguarded to ensure a safe passage for any traffic using the road.

**M7204 MEASUREMENT**

Payment under this section will be for the execution of the work for the all-emergency normalisation.

**M7200 ALL EMERGENCY NORMALISATION**

<u>Item</u>	<u>Unit</u>
M720.01 All-emergency normalisation	
(a) Accident restoration	hour
(b) Clearing of spillages	hour
(c) Sheltering of animals	hour
(d) Fire fighting	hour
(e) Safeguarding of dangerous area	hour

The unit of measurement shall be the number of hours spent at the scene of the accidental event in the execution of all work necessary to normalise, restore or safeguard the roadway and road surface. Travelling time to and from the scene is excluded.

The tendered rates shall include full compensation for all costs of operation of the emergency team and equipment in the execution of the work.

The tendered rates shall be deemed to include full compensation for all labour, overheads, head-office expenses, profits, fuel and disbursements.

Payment for any materials used as ordered by the Engineer, will be made under item M910.04 in the dayworks schedule.

**SERIES M8000 : STRUCTURE REPAIR**

**SECTION M8100 : MINOR REPAIRS TO STRUCTURES**

**CONTENTS**

M8101	SCOPE
M8102	EXECUTION OF WORK
M8103	ACCOMMODATION OF TRAFFIC
M8104	MEASUREMENT AND PAYMENT

**M8101 SCOPE**

This section covers the work in connection with the minor repairs to structures. Repair work is regarded as specialised work and shall be undertaken by nominated Subcontractors with relevant experience.

**M8102 EXECUTION OF WORK**

The detail and specification will be supplied by the Engineer for the minor repair to structures.

**M8103 ACCOMMODATION OF TRAFFIC**

The cost of the accommodation of traffic for this section is included in the provisional sum of sub-item M810.01 (a).

**M8104 MEASUREMENT AND PAYMENT**

**M8100 MINOR REPAIRS TO STRUCTURES**

<u>Item</u>	<u>Unit</u>
M810.01 Minor repairs to structures	
(a) Provisional Sum	provisional sum (Prov Sum)
(c) The Contractor's overhead charges and profit in respect of sub-item M810.01 (a).	percentage (%)

Payment shall be made in accordance with Subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999.

The tendered percentage for sub-item M810.01 (b) is a percentage of the amount actually spent. The percentage shall include for the overhead charges and profit of the Contractor in connection with the repairs to structures.

**SERIES M9000 : DAYWORKS**

**SECTION M9100 : DAYWORKS SCHEDULE**

**CONTENTS**

M9101	SCOPE
M9102	ORDERING OF DAYWORK
M9103	WORK RESERVED FOR DAYWORK
M9104	MEASUREMENT AND PAYMENT

**M9101 SCOPE**

This section covers the listing of daywork items for use in determining payment for work which cannot be quantified in specific units in the Schedule of Quantities, or work ordered by the Engineer, during the construction period which was not foreseen at tender stage for which no applicable rate exists in the Schedule of Quantities.

**M9102 ORDERING OF DAYWORK**

No daywork shall be undertaken unless written authorisation has been obtained from the Engineer.

**M9103 WORK RESERVED FOR DAYWORKS**

The following specific types of work regarding road maintenance is reserved for inclusion under dayworks and for payment under the relevant items in the dayworks schedule:

- (a) Installation of rumble strips
- (b) Installation of counting stations
- (c) Brooming of road surface at junctions or where required
- (d) Sheltering of animals
- (e) Dismantling of unauthorised structures including hawkers and squatters
- (f) Control and extinguishing of fires
- (g) Moving of New Jersey barriers
- (h) Moving of squatters under bridges and culverts
- (i) Removal of motor wrecks, automotive parts and stripped tyre treads where left in the road reserve other than such items as to be removed by the Contractor in terms of his obligations under the various other sections of these Specifications
- (j) Removal of obstructions from the road reserve
- (k) Clearing of waterway structures
- (l) Removal of illegal signs outside the road reserve.
- (m) Replacing of damaged facilities i.e. litter containers and tables and benches at lay-bays

(n) Other (specify)

#### M9104 MEASUREMENT AND PAYMENT

Accommodation of traffic will not be paid separately and any cost associated with it must be included in the rates in Section M0500:

The following daywork items are applicable to dayworks and are included under the applicable section of the Schedule of Quantities:

#### M9100 DAYWORKS

<u>Item</u>	<u>Unit</u>
M910.01 Labour during normal work hours:	
(a) Unskilled	hour (h)
(b) Semi-skilled	hour (h)
(c) Skilled	hour (h)
(d) Ganger	hour (h)
(e) Flagmen	hour (h)
<u>Item</u>	<u>Unit</u>
M910.02 Labour outside normal working hours	
(a) Outside normal working hours and Saturdays	
(i) Unskilled	hour (h)
(ii) Semi-skilled	hour (h)
(iii) Skilled	hour (h)
(iv) Ganger	hour (h)
(v) Flagmen	hour (h)
(b) Sundays and public holidays	
(i) Unskilled	hour (h)
(ii) Semi-skilled	hour (h)
(iii) Skilled	hour (h)
(iv) Ganger	hour (h)
(v) Flagmen	hour (h)
<u>Item</u>	<u>Unit</u>
M910.03 Transport and equipment	
(a) Tipper Trucks	
(i) 3 to 5 ton capacity	hour (h)
(ii) More than 5 ton capacity	hour (h)
(b) Loader (0,5m <sup>3</sup> bucket)	hour (h)
(c) Grader (CAT 140 G or similar)	hour (h)

(d)	Compactor (Bomag BW 90)	hour (h)
(e)	Water truck (5 000 litre)	hour (h)
(f)	Mechanical broom	hour (h)
(g)	Tractor-trailer combination (43kW, 3 ton min.)	hour (h)
(h)	Suitable truck/bus for transporting labourers (specify size)	hour (h)
(i)	Safety vehicle for pre-marking purposes	hour (h)
(j)	Compressor (air) including hoses and tools (specify size)	hour (h)
(k)	Dewatering pump including generators and accessories (specify size)	hour (h)
(l)	Mobile electric welding sets and accessories (specify size)	hour (h)
(m)	Cutting torch with mobile electric & oxy acetylene installation	hour (h)
(n)	Mobile concrete mixers (specify size)	hour (h)
(o)	Flat bed truck (specify size)	hour (h)
(p)	Light delivery vehicle (LDV)	hour (h)
(q)	Centremount cranes (specify size)	hour (h)
(r)	Portable generator set	hour (h)
(s)	Establishment of loader (bucket 0,5m <sup>3</sup> ) to site	number (No)
(t)	Establishment of grader (CAT 140 G or similar)	number (No)
(u)	Other (specify)	(      )

<u>Item</u>	<u>Unit</u>
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M910.04	Procurement of materials	
(a)	Procurement of materials	provisional sum (Prov Sum)
(b)	The Contractor's overhead charges and profit in respect of sub-item M910.04(a)	percentage (%)

<u>Item</u>	<u>Unit</u>
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M910.05	Extra over item M910.03 for establishment, within 24 hours, of:	
(a)	Tipper trucks	
	(i) 3 to 5 ton capacity	number (No)
	(ii) More than 5 ton capacity	number (No)
(b)	Loader (0,5m <sup>3</sup> bucket)	number (No)
(c)	Dewatering pump including generators and accessories (specify size)	number (No)



(d)	Water truck (5000 litre)	number (No)
(e)	Other (specify)	(       )

The unit of measurement for items M910.01, M910.02 and M910.03 shall be as the unit specified for the item of equipment or personnel. The tendered rates shall include for transport of personnel and equipment to and from site. Non-working hours for transport breakdown, lack of operator or any other reason shall not be measured.

The unit of measurement for sub-items M910.03 (s) and (t) shall be the number of times the equipment is established on site. Establishment shall be measured once for the same operation.

The unit of measurement for sub-item M910.04(a) shall be the amounts actually paid for the procurement of materials and shall be made in accordance with the provisions of FIDIC Conditions of Contract for Construction, 1999.

The percentages tendered for sub-item M910.04 (b) shall be the percentage of the amounts actually paid for the procurement of materials as ordered under sub-item M910.04 (a) and shall be in full and final compensation in respect of the Contractor's handling costs, profit and all other charges in connection with the procurement and supply of the materials to the point of usage.

The payment for item M910.05 shall be paid for as an extra-over to the tendered rates under item M910.03 for the establishment of certain equipment within 24 hours of receiving an instruction from the Engineer.

The tendered rates submitted for labour for items M910.01 and M910.02 should cover overhead charges and profit, site supervision, use of small hand tools and appliances, non-mechanical equipment and consumable stores.

The tendered rates for vehicles equipment for item M910.03 shall be an all-inclusive hire charge for the use of the vehicle and driver or equipment and operator.

Measurement shall only be for work instructed and directed by the Engineer, where the Engineer considers no other appropriate rate is available in the Schedule of Quantities.

The tendered price shall include full compensation for all administrative, supervisory, operative and contingent costs and profit, relating to the running of the equipment or the supply of personnel and materials.

The calculation of compensation for daywork in terms of Clause 13.6 of the FIDIC Conditions of Contract for Construction, 1999 shall not apply to daywork measured and paid for under the scheduled items, and no further than mark-up profit shall be added to the tendered rates.

Prior to the commencement of any work by the labourers described under items M910.01 and M910.02, the Contractor must obtain agreement from the Engineer regarding the classification of all labourers in terms of "unskilled", "semi-skilled" and "skilled" labourers.