THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED

STANDARD SPECIFICATIONS FOR ROUTINE ROAD MAINTENANCE

APRIL 2019 **VOLUME 2**

ISSUED BY:

CHIEF EXECUTIVE OFFICER
SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED
48 TAMBOTIE AVENUE
VAL DE GRACE
PRETORIA, 0184

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SERIES M0000: GENERAL

SECTION M0100: DEFINITIONS AND TERMS

CONTENTS

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 BORROW MATERIAL

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 BRIDGE

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 6 m 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 CARRIAGEWAY

The surface normally traversed by vehicles and which consists of one or a number of contiguous traffic lanes, including auxiliary lanes and shoulders.

M0105 CATCHWATER DRAIN OR BANK

A longitudinal drain or bank outside the road prism for diverting water that would otherwise flow onto the road prism.

M0106 CONTRACTOR'S EQUIPMENT

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), plant, materials and any other things intended to form or forming part of the permanent works.

M0107 COST

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 CULVERT

A structure other than a bridge, which provides an opening under the carriageway or median for drainage or other purposes.

M0109 CUT

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 DEBRIS AND LITTER

Debris and litter is defined as all foreign articles which, inter alia, shall include litter, branches, trees, concentrated piles of refuse, animal carcasses, dangerous objects, stones larger than 75 mm but smaller than 300 mm, posters, illegal signs less than 0,5 m^2, spilled loads from vehicles, tyres and stripped tyre treads, and accident debris,

M0111 EDGE BREAK

Edge break is defined as the failure of the edge of the surfacing up to a maximum width of 300 mm from the continuous edge of surfacing.

M0112 EMERGENCY SERVICES

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

The team assisting with emergency accidental events to normalise, restore or safeguard any dangerous area in order for the safe passage of any traffic using the road.

The team will be on 24-hour standby and located optimally to minimise the responding time for emergencies on weekdays, weekends and public holidays.

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 particular 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 and under-passes outside the fence, intersections and the road reserve of cross roads up to the limits of the Employer's responsibility. It includes the removal and disposal 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 centre line 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 NON-PERFORMANCE BASED

Work undertaken on a non-performance based basis on instruction as and when required. Payment is due when the work undertaken complies with the acceptance criteria.

M0125 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.

M0126 PERFORMANCE BASED

Work undertaken on a performance based basis which shall be undertaken on an ongoing basis to ensure it meets the specified criteria. Inspection of the work for payment purposes is carried out at specified intervals on selected sections. Payment is due when the inspected sections comply with the acceptance criteria, with a reduction in payment due when any section inspected is not compliant.

M0127 PLANT

The apparatus, machinery and vehicles intended to form or forming part of the permanent works.

M0128 POTHOLE

Potholes are surface failures, which extend into the base layer forming a hole. Normally such failures would be less than 0,5 m² in area, are isolated and are not associated with displacement.

M0129 PROJECT SPECIFICATIONS

The specifications relating to a specific project, which form part of the contract documents for such project, and which contain supplementary and/or amending specifications to the standard specifications.

M0130 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.

M0131 REPAIR

Repair means all action required in rectifying a defect.

M0132 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.

M0133 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.

M0134 SERVICES

Cables, pipes or other structures to provide inter alia, conduits for electricity, water, sewage, telephone, fibre optic, fuel and gas.

M0135 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 travelled way and the shoulder breakpoint.

M0136 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 pre-determined radius.

M0137 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, designated areas and the road reserve of cross roads up to the limits of the Employer's responsibility. It includes the removal and disposal of the grass cuttings by means of mechanical balers or by hand.

M0138 SIDE DRAIN

An open longitudinal drain situated adjacent to and at the bottom of cut or fill slopes.

M0139 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.

M0140 SPOIL (MATERIAL)

Material originating from construction operations and which is not utilised for construction purposes.

M0141 SUBSOIL DRAINAGE SYSTEM

A system of subsoil drainage pipes (including any permeable material) constructed to intercept and remove subsoil water.

M0142 SURFACE FAILURES

Surfacing failure 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.

M0143 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.

M0144 VERGE

The area between the outer edge of the road prism and the boundary of the road reserve.

M0145 WATERWAY STRUCTURE

A structure is classified as a waterway structure when the inlet area of the structure is larger than 5 m^2

SERIES M0000: GENERAL

SECTION M0200: GENERAL REQUIREMENTS AND PROVISIONS

CONTENTS

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 shall 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 shall 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

In terms of subclause 4.9 of the FIDIC Conditions of Contract for Construction, 1999 the Contractor shall institute a quality assurance system to demonstrate compliance with the requirements of the contract. The Contractor shall submit the quality assurance system he proposes using, to the Engineer for his approval, within 28 days of the Commencement Date. Once accepted by the Engineer, the Contractor shall not deviate from it unless written notification of proposed changes have similarly been submitted and approved. The system shall record the lines and levels of responsibility, and indicate the method by which testing procedures will be conducted. The Engineer shall audit any aspect of the Contractor's quality assurance system. Should the Contractor's quality assurance fail in any aspect of his quality assurance system, he will be penalised by the amount specified in the Project Specifications per incident.

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 road markings, drainage structures and side drains and any roadside furniture.

Where setting out is required, the Engineer will point out the relevant beacons, benchmarks, pegs and end of road reserve pegs at intersections to the Contractor. The Contractor shall check that they have not been disturbed and are true with regard to position and level, and maintain 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. These signs are to be erected not later than one month after the Contractor has been given access to the site. A special payment item is incorporated in the Bill of Quantities relating to payment for the sign boards.

No sign boards 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 sign board of less than 2 m^2 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 International Metric System (SI).

(b) Bill of Quantities

The quantities set out in the Bill of Quantities are estimated quantities and do not necessarily represent the actual amount of work to be done 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 200 m 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 150 mm 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 Bill of Quantities.

Where the Contractor has entered no rate or price against a pay item in the Bill 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 Bill 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 Bill 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 is provided for as a lump sum in the summary of the Bill 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 Bill 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 particular 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 Bill 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 Bill 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 Bill of Quantities. No expenditure will be authorised without an approved variation order.

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. However, if the work is executed by the Contractor using rates from the daywork schedule, then the sum for overhead charges and profit in terms of subclause 13.5 (b)(ii) is not applicable.

The sum for overhead charges and profit, calculated as a percentage on any provisional sum item, for work done by nominated subcontractors 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 Bill 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 subclauses 14.3 and 14.6 of the FIDIC Conditions of Contract for Construction, 1999 the Contractor must submit his Payment Certificate together with supporting documents for payment each month. Details of the format are available from the Employer. The Employer has an electronic data capturing programme (ITIS) available that must 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.

"(i) Rates to remain unchanged

Dependent on the rates and prices offered in the Bill of Quantities, the employer intends to increase or reduce the scope of work to match the budget allowed for this project. The value of such increase or reduction in the scope of works shall not give cause for the contractor to vary the offered rates and prices, which shall remain final and binding for the duration of the contract."

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 road markings and installation or cleaning of road studs where applicable.

(b) Maintenance of above ground 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 make his own arrangements regarding the procuring of gravel material from approved borrow areas or from commercial sources.

The Contractor's approved tendered rates in respect of material originating from such sources shall include full compensation for supply, procurement and furnishing of such materials.

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 to 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;

(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; and

(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 the obligations under any written agreement, or

(ii) in the absence of a written agreement, 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 ADVERSE CLIMATIC CONDITIONS

There will be no extensions of time on the completion of this contract due to adverse climatic conditions.

However, should the Contractor, due to the occurrence of adverse climatic conditions not be able to carry out the works, or not meet the rate of progress specified, then the Engineer shall determine the number of days lost due to the occurrence of adverse climatic conditions on the critical path method for the activities that can attract penalties.

A delay caused by adverse climatic conditions will be regarded as a delay only if, in the opinion of the Engineer, progress on an activity of work of which the activity's progress has been specified has been delayed. 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 penalty the Contractor attracted for completing the works after the specified time.

Should the occurrence of adverse climatic conditions 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 adverse climatic conditions in respect of the activities affected by the adverse climatic conditions, as determined by the Engineer. However, if an extension of time is granted by the Engineer, this extension of time will only be for the activity not completed and will not attract any payment for time related obligations or other cost than the tendered rate for the outstanding activity.

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 shall be held responsible for all damage to the road and road furniture comprising road signs, road markers, bridges, guardrails, 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 or his sub-contractors. 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 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 Bill 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 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 to carry out any periodic maintenance, special maintenance, rehabilitation or any other construction work. These sections will be excluded from the Contractor's obligations to carry out routine road maintenance work. In addition, an adjustment will be made to the tendered rates for any performance based items of work where this are excluded.

The Contractor may be appointed as a nominated Subcontractor by the construction Contractor to do the routine road maintenance work as specified for that section of road.

M0218 DAILY ACTIVITY RECORDS

The Contractor shall furnish the Engineer with daily records the next working day, using the ITIS applications or if not capture in ITIS 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 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.

M0222 WELLNESS PROGRAM

(a) Site arrangements

The Contractor is required to facilitate a Wellness Program for site employees and their immediate family (spouse/partner and children). The Employer will appoint a service provider who will conduct the Awareness, Counselling and Testing (ACT) process at a suitable venue. For any immediate family situated away from the site, the wellness service provider will make arrangements for the ACT process to be conducted at nearby facilities, if available. The Contractor shall provide a structured plan of how the ACT process will be implemented.

The Contractor is to provide an independent lockable office for use by the Wellness Champion which includes within, office furniture including lockable storage facilities and the supply of paper and stationery, an available telephone line, fax facilities, a computer and printer with internet and email facilities.

The Wellness Process may not be used by the Contractor to fulfil his Occupational, Health and Safety obligations for his employees.

(b) Wellness Champion

The Contractor is to provide a Wellness Champion who will be responsible for managing the wellness program on site. The appointment will be subject to approval by the Engineer.

The Wellness Champion has to meet certain minimum criteria as follows:

(i) Grade 12;
(ii) driver's license Code 8;
(iii) intermediate level of computer literacy;
(iv) excellent communication skills; and
(v) excellent report writing using qualitative and quantitative performance indicators.

(c) Wellness Champion duties

The duties of the Wellness Champion will be as follows:

(i) implement and manage a Wellness Programme on site;
(ii) co-ordinate the logistics for the Awareness, Counselling and Testing (ACT) sessions on site.
(iii) create an enabling environment in the workplace for workers with health issues;
(iv) refer workers to local Clinics (Department of Health) to access effective treatment;
(v) regular toolbox talks with workers;
(vi) attend quarterly facilitation meetings on site and annual combined meeting;
(vii) create and maintain a database of all workers and immediate families, local NGO's and clinics; and
(viii) reporting on site meetings, toolbox talks, weekly planning sheets and monthly reports to service provider.

(d) Wellness Program costs

There is separate provision for the costs of providing transport and communication for the Wellness Champion, ACT venue, transport for the site employees and their immediate family (situated with the site employees) to attend the ACT process, and wages of the workers whilst away from work attending the ACT process.

M0223 SECURITY SERVICES

(a) Security services

The Contractor will employ the services of a suitably qualified and experienced security service provider(s) to assist the RRM personnel in performing their duties.

This will be an ad-hoc service as instructed by the Engineer. This service will include vigilant crime prevention patrolling and monitoring, armed response to suspected criminal activity, security incident management and reporting, incident trend analysis and deployments and the operation of a control centre to manage deployments and to receive and disseminate reports from the public or specific agencies of criminal activity against infrastructure.

The Service Provider will therefore rely on the Engineer to determine its operational focus of activities to specific identified high risk areas.

The Service Provider must consider the following when assessing the security risk of the site:

- Do an assessment of the socio-economic environment of the area in which the project will be undertaken. It is important to determine issues that may impact on the security of the project, e.g. population density, unemployment and poverty levels and levels of education in the area.
- Determine the crime profile of the area, focussing on contact crimes and property-related crimes. It is important to liaise with security service providers in the area, which will be in the best position to provide information on crime trends in the area.
- Determine and compile the minimum-security requirement for the protection of SANRAL interests at road maintenance projects. This requirement should guide contractors on SANRAL's expectations to secure assets which may lure criminals to the construction activity.
- Implement the stakeholder engagement process as per SANRAL's guidelines in which the community is informed about the forthcoming SANRAL road maintenance activity and the requirements (i.e. correct procedures) for becoming involved in the project. Among others this includes the opportunity for work and job requirements. This should be done to deal with the expectations of the community to find work during the time of construction.
- Establish a database where incidents of a security nature and information on security threats concerning the road maintenance projects could be kept. This information should be used for analysing the security (and safety) risk profile of the environment.

At areas where SANRAL projects are underway and particularly where the recommendations stated above have been implemented, implement a stability monitoring model to ensure that the security risks originating from the environment are assessed on a regular basis.

Security Services may include (but are not limited to):

- Protection services to RRM personnel
- Physically inspect the documentation of parties working on highway infrastructure in order to ascertain the validity of their presence and will remove the said parties from the area if these parties are not authorised or are trespassing
- Assist with the statutory functions of the RRM team and remove unauthorised people on instruction of the Engineer.

(b) Security Guards

Security guards must be registered with the Private Security Industry Regulatory Authority (PSIRA) and graded accordingly.

Applicable Grades include:

<u>Grade A Guards</u>

- A grade A's main function would normally be a site manager or commander.
- Controlling and managing a number of functions.
- Managing the security workforce
- Conducting risk assessments and evaluations on site daily.
- Basic investigative skills.

- Problem solving.
- Designing security solutions.

Grade B Guards

- A Grade B's main function is access control in high-risk areas where documentation and basic computer skills might be required.
- A site or shift commander.
- Managing of lower grade security officers.
- Possible inspector doing site visits.

Grade C Guards

A Grade C's main function is access control of a higher risk area and supervision of lower grade security officers.

Grade D Guards

A Grade D's main function is access control.

For the required services, security guards of grades B & C will be utilised. From time to time armed guards will be required.

(c) Response Vehicles

The response vehicles must be able to access most areas in road reserve. The vehicle can be a sedan or LDV with good ground clearance and in good mechanical condition without visible damage, to be maintained in good condition and cleaned regularly.

The vehicle must be clearly marked "Route Security Operations" (High visibility at night and day) on sides and front and back of vehicle.

Each response vehicle will be staffed by a driver (at least PSIRA Grade C) and a patrol leader (at least PSIRA Grade B). At least one of these guards must be armed.

(d) Communication System Requirements

The communication system must be able to reach all points of the road network, including the road reserve and all points 30 metres on either side of the road reserve edge.

All security guards posted on the highway, and all vehicles must be able to communicate to each other independently of the public cellular networks. It is acceptable to utilise commercial repeater access networks for this purpose.

(e) Emergency Lane Usage

The Security Company's response vehicles, deployed for the SANRAL project only, shall be allowed to utilise the freeway emergency lane, for emergency response purposes. A letter of authorisation will be issued by SANRAL, specifying the exact regulations that will be applicable in this regard.

M0224 MEASUREMENT AND PAYMENT

Item		Unit
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 and drawings.
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.

Item		Unit
M020.02	Compensation to landowners	
(a)	Compensation to landowners	provisional sum (PS)
(b)	Overhead charges and profit on sub item M020.02 (a)	percentage (%)

Measurement and payment shall be in accordance with the provisions of sub clause 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.

Item		Unit
M020.03	Advertising cost	
(a)	Advertising cost	provisional sum (PS)
(b)	Overhead charges and profit on sub item M020.03 (a)	percentage (%)

Measurement and payment shall be in accordance with the provisions of sub clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999.

The tendered percentage is a percentage of the amount actually spent under subitem M020.03 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

This item will be used for the cost of advertising on instruction of the Engineer. This item shall not include any costs related to advertisements for the tender processes for subcontractors.

Item		Unit
M020.04	Stakeholder and Community Liaison and Social Facilitation	
(a)	Cost of Liaison, Social Facilitation and PLC Support	provisional sum (PS)
(b)	Handling cost and profit in respect of sub-item M020.04 (a)	percentage (%)

The provisional sum for item M020.04(a) shall cover the direct costs incurred by attending members of the PLC. The rate of compensation shall be fair and agreed by the Engineer in accordance with clause 13.5 of the FIDIC Conditions of Contract. The tendered percentage for sub-item M020.04(b) shall include full compensation for all handling costs and profit of the Contractor associated with sub-item M020.04(a).

The liaison with, and assistance provided by the Contractor to, the PLC to perform its duties shall not be paid from the provisional sum. The Contractor's costs to liaise with the PLC and render such assistance shall be deemed to have been included in its rate offered for pay sub-item M030.03: Time-related obligations.

The tendered percentage for sub-item M020.04 (b) 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.

Item	Unit

M020.05 Target Group Participation

Refer to Part D of the Routine Road Maintenance Works Contract Volume 3 for payment description.

Item	Unit

M020.06 Training, Coaching, Guidance, Mentoring and Assistance

Refer to Part D of the Routine Road Maintenance Works Contract Volume 3 for payment description.

Item	Unit

M020.07 Wellness program

(a)	Office facilities for Wellness Champion	month
(b)	Wellness Champion	provisional sum (PS)
(c)	Venue for ACT process	provisional sum (PS)
(d)	Transport for workers and their immediate Families to ACT process	provisional sum (PS)
(e)	Remuneration for workers during ACT Process	provisional sum (PS)
(f)	The Contractor's overhead charges and Profit in respect of sub item M020.07 (be) to (e)	percentage (%)

The tendered rate for sub-item M020.07 (a) is the month and shall include full compensation for all the Contractor's costs arising from the provision of an independent lockable office for use by the Wellness Champion which includes within, office furniture including lockable storage facilities and the supply of paper and stationery, an available telephone line, fax facilities, a computer and printer with internet and email facilities.

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999.

The provisional sum under sub-item M020.07 (b) shall be used to cover the costs of the Wellness Champion which includes salary, bonuses, leave and sick leave outside the standard industry shutdown period, and all company contributions such as Provident Fund, Group life benefits, medical aid, and UIF. Further provision for a cellular phone allowance shall be included in this provisional sum

The provisional sum under sub-item M020.07 (c) shall be used to cover the costs of hiring the venue for the ACT process.

The provisional sum under sub-item M020.07 (c) shall be used to cover the costs of transport for the workers and their immediate family to the venue for the ACT process.

The provisional sum under sub-item M020.07 (e) shall be used for the daily wage in normal work hours of the individual workers whilst they are away from their normal duties and attending the ACT process.

The tendered percentage for sub-item M020.07 (f) is a percentage of the amounts actually spent under sub-items M020.07 (b) to (e), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M020.08	Transport for Wellness Champion	
(a)	Transport for Wellness Champion	provisional sum (PS)
(b)	The Contractor's overhead charges and profit in respect of sub-item M020.08 (a)	percentage (%)

The provisional sum under sub-item M020.08 shall be used to cover the costs of transport for the Wellness Champion as determent by SANRAL.

Item		Unit
M020.09	Provision of security services	
(a)	Provision of Grade C Security Guards	Person-day
(b)	Provision of armed Security Guards	Person-day
(c)	Provision of response vehicles	Hour

The rate for item M020.09 (a) & (b) shall include full compensation for the hiring of the guards, all necessary logistics and transport to deploy them on any location along the entire route, provision of communications equipment, supervision and all other costs related to the provision of the guards.

The unit of measurement for item M020.09 (c) shall be the number of hours spent at the scene of the event in the execution of security services. Travelling time to and from the scene is excluded.

The tendered rates shall include full compensation for all costs of operation of the service 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.

Item		Unit
M020.10	Provision of security services	
(a)	Provision of armed security services on national roads	provisional sum (PS)
(b)	The Contractors overhead charges and profit in respect of pay item M020.10 (a) above	percentage (%)

Measurement and payment shall be in accordance with the provision of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for pay item M020.10(b) is a percentage of the amount actually spent under pay item M020.10(a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M0000: GENERAL

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

CONTENTS

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 be responsible for all Contractor's equipment. When brought on to the site, Contractor's equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the site any essential work related items of Contractor's equipment without the consent of the Engineer. However, consent shall not be required for vehicles transporting goods or Contractor's personnel off site.

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.

The tendered lump sum shall not include any fixed obligation costs for the subcontracts involving a targeted enterprise each. and "The Camp Site of the Contractor shall be within a radius of 15km from the town centre." and
"It is also a requirement that the Site Agent and Route Manager shall drive the site together once per week." and "It is also a requirement that the Contractor provide a 10 seater bus once a month for the purpose of a site visit, journey included.

(b) Office for the Engineer

The Contractor will provide the Engineer with 2 separate offices of 15m² each and 2 carports for the sole use of the Engineer 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 2,4 m minimum. All windows shall be of the type that can open over the full window area.

The Contractor shall provide and install a low noise split unit air-conditioning unit for each 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 the carports for the Engineer to protect the Engineer's vehicle at all times against the direct rays of the sun. The carports shall be at least 20m² each 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 cleaning services, internet (ADSL WiFi), electricity, water and sewerage

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

The Contractor shall provide 4 high quality safety vests for visitors approved by 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) Mobile phone

It is a requirement of the contract that the Contractor's site personnel be provided with mobile phones to allow for effective communication between the Contractor's personnel, as listed in the Project Specifications. The mobile phone specifications shall comply with the minimum requirements as per the Project Specifications. All costs associated with the provision of the mobile phones will be viewed as being covered by this section.

(f) Occupational health and safety

The Contractor shall comply with the Occupational Health and Safety Act, 1993 (Act No 85 of 1993) as well as all applicable Regulations. The contractor remains responsible for the health and safety of his employees and those of his Mandataries. The specifications with which the Contractor shall comply with are detailed in the Project Specifications.

(g) Management of the environment

The Contractor shall be responsible for construction according to an Environmental Management Plan in terms of the specifications detailed in the Project Specifications. The Contractor must take the utmost care to minimise the impact of his establishment and other construction activities on the environment and must adhere to the requirements as set out in the specifications.

(h) Reporting

The Contractor shall compile and submit monthly reports on his activities and obligations relating to employment, training, subcontractor development, and other aspects in terms of the specifications contained in the Project Specifications. Some of these reports are to be submitted onto the Employer's Project Information Module.

M0303 INTEGRATED TRANSPORTATION INFORMATION SYSTEM

The Employer has developed a comprehensive information management tool called ITIS (Integrated Transportation Information System) to address all facets of its strategic and tactical planning, design, construction and maintenance of the entire road network. This provides support for the management tasks of the Employer and to allow the personnel to make technical decisions more quickly and efficiently.

ITIS is an integrated approach to the sharing and inter-relating of technical performance information for the Employer, and relies on people following procedures to populate system with data. ITIS currently consists of the following platforms:

- ITIS Web – Web enabled portal providing online access to various functions, workflows and reports.
- ITIS Desktop – Offline data capture tool enabling the capture of information offline, validation and then synchronisation of data with the ITIS database.
- ITIS Mobile – Application (Android 6.0 or later) that allows the in-field capture of information using a smart phone or tablet (must have camera and GPS), validation and then synchronisation of data with the ITIS database.

The Employer has several ITIS modules running on any of the above ITIS platforms which affect the Contractor, who will need to use these modules to perform certain procedures and to provide required information. The current modules applicable to routine road maintenance and their description are as follows:

- Contract Module – management of contracts;
- Routine Road Maintenance Module - issuing of job instructions (estimates, photographs and workflows) and preparing the payment certificate;
- Incident Module – recording of incidents on site; and
- Project Information Module – employment and training data.

User manuals for the various functions can be downloaded from https://itis.nra.co.za/Portal/MyAccount/UserManuals after the successful registration as a Public user.

Routine Road Maintenance ITIS Module

The Employer's ITIS module is managed by the Engineer, which records the work done and prepares a payment certificate. The timelines for the various stages of the Interim Payment Certificate from the initial preparation by the Engineer, to the submission by the Engineer to the

Employer for payment, will be identified by the Employer, and may vary in certain months due to financial deadlines, or shutdown periods.

The work flow sequence is as follows:

(i) Work is identified by the Engineer or Contractor using ITIS mobile application.
(ii) The Engineer then issues a Job Instruction for the work to be executed, complete with measurement and rates of the work to be executed via the ITIS mobile application.
(iii) Engineer prepares an interim Job Instruction for the work to be executed.
(iv) Contractor determines whether he will do the work or allocate the work to an appointed subcontractor using the ITIS mobile application.
(v) On arrival at location, the Contractor/subcontractor capture various stages of progress of the works using ITIS mobile application.
(vi) On completion of the work, the Contractor provides measurement of the work executed via the ITIS mobile application, which the Engineer checks for quality and measurement acceptance.
(vii) The Engineer signs off the details of the Job Instruction, partially or fully completed, on ITIS module.
(viii) On a measurement date determined by the Engineer the completed Job Instructions shall be included in a payment certificate, the Engineer shall provide a draft payment certificate to the Contractor for checking purposes.
(ix) The Contractor shall notify the Engineer of any amendments or corrections to the draft payment certificate.
(x) The Engineer shall then prepare the Interim Payment Certificate from ITIS module for submission by the Contractor as his Statement in terms of sub-clause 14.3 of the FIDIC Conditions of Contract, for approval by the Engineer and submission to the Employer for payment.

M0304 MEASUREMENT AND PAYMENT

Item		Unit
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 tendered lump sum shall not include any fixed obligation costs for subcontractors.

The lump sum tendered shall represent full compensation for the fixed part of the Contractor’s general obligations, i.e. 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.

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 contract period reaches half of the contract period.

(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.

Item		Unit
M030.02	Value Related Obligations	lump sum (LS)

The lump sum tendered under item M030.02 shall represent full compensation for that part of the contractor's general obligations, which is a function of only the value of the work, but not of the period of completion. Should the final value of work (excluding CPA and special materials adjustments) increase or decrease in relation to the tendered amount (excluding CPA and special materials adjustments), the lump sum tendered for item M030.02 will be increased or decreased pro rata in full settlement of any difference in value related general obligations resulting from an increase or decrease value of the work. However, should the said increase in the final value of the work exceed twenty (20) percent of the tendered amount, the pro rata adjustment will only be applied up to the limit of twenty (20) percent

The lump sum tendered in item M030.02 will be payable monthly in installments in relation to the value of work done (excluding CPA and special materials adjustments)

Item		Unit
M030.03	Time-related obligations	
(a)	General obligations	month
(b)	Occupational health and safety obligation	month
(c)	Environmental obligations	month
(d)	Reporting obligations	month

The tendered rate per month for subitem M030.03 (a) 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, excluding occupational health and safety, which are mainly a function of time.

The tendered rate per month for sub-item M030.03 (a) 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 obligations, excluding occupational health and safety. The tendered rate per month shall include full compensation for all the Contractor's costs arising from subletting to subcontractors including, but not limited to, the provision of supervision, assistance required in terms of the specifications, and the administration of the subcontracts. It shall not include any costs of the Contractor for the coaching, guidance and

mentoring of subcontractors. The tendered rate per month shall not include any costs for the time-related obligations of subcontractors. The Tendered rate shall further include for providing for the following including all associated costs:

- Guidance, assisting and mentoring of sub-contractors.
- A 10 seater bus once a month for the purpose of a site visit, journey included as well as meeting venue for monthly site meetings.
- The Site Agent and Route Manager shall drive the site together once per week.
- The site agent shall be issued with a Smartphone to interact with SANRAL's ITIS maintenance module in terms of GPS, photos, web downloads etc.
- Include the provision of a vehicle tracking system in the Route Patrol vehicle, dashcam including data storage facilities for min 1 complete project video per week (archived),
- ADSL or similar uncapped internet connection. The data usage cost shall be split between the Contractor and the Engineer.

The tendered rate per month for sub-items M030.03 (b) and (c) represents full compensation for that part of the Contractor's health and safety, and environmental obligations.

The tendered rate per month for sub-item M030.03 (d) represents full compensation for that part of the Contractor's reporting obligations. The tendered rate shall include full compensation for compiling the information regarding employment, training, subcontractor development, and other aspects in terms of the specifications, and capturing it on the project information module or submitting it by alternative means, monthly, within 5 working days the month after the reporting month, for the full duration of the Contract, it shall further include for all personnel and other costs, disbursements, overheads and profit.

Item		Unit
M030.04	Additional costs for Subcontractors	

Refer to Part D of the Routine Road Maintenance Works Contract Volume 3 for payment description.

Item		Unit
M030.05	Tender Process for Targeted Enterprises	

Refer to Part D of the Routine Road Maintenance Works Contract Volume 3 for payment description.

Item		Unit
M030.06	Responsibilities of the contractor towards Targeted Enterprises	

Refer to Part D of the Routine Road Maintenance Works Contract Volume 3 for payment description.

Item		Unit
M030.07	Construction Works by Targeted Enterprises	

Refer to Part D of the Routine Road Maintenance Works Contract Volume 3 for payment description.

Item		Unit
M030.08	Preparing and Maintaining a Portfolio of Evidence for for each subcontractor	
(a)	Preparing and Maintaining a Portfolio of Evidence for each subcontractor	provisional sum (PS)

(b)	The Contractor's overhead charges and profit in respect of subitem M030.08 (a)	percentage (%)

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for sub-item M030.08 (b) is a percentage of the amount actually spent under sub-item M030.08 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M0000: GENERAL

SECTION M0400: ROUTE PATROL

CONTENTS

M0401 SCOPE

This section covers the provision of a route patrol along the entire site which shall be executed by a route patrol to carry out duties such as road inspections, minor road repairs, removal of debris on the road and provide assistance to motorists. The route patrol comprises of a vehicle, equipment and personnel.

A distinction is made between general duties and additional maintenance duties depending on the nature of the site. Urban roads may require a route patrol to perform general duties only, whereas rural roads may require a route patrol to perform maintenance duties in addition to the general duties.

M0402 GENERAL REQUIREMENTS

(a) Execution of work

The Contractor shall provide a dedicated route patrol along the entire site as specified in the Project Specifications.

The dedicated route patrol shall be responsible for the general duties as specified. Where it is a requirement of the Project Specifications, the route patrol may be required to perform additional maintenance duties. These maintenance duties shall be in addition to the general duties specified.

On dual carriageway roads, both carriageways shall be travelled along its full extent, and shall include the ramps and crossroads. On single carriageway roads, the route needs only be travelled along in one direction to fulfil the route patrol duties on both sides of the road. The frequencies of the route patrol service are specified in the Project Specifications.

During inspection of the road the route patrol shall notify the Engineer, and the relevant road traffic authority, police, emergency service or other appropriate agencies, of any particular activity, incident and accident deemed essential of being reported using the ITIS Mobile Incident module. The Contractor shall follow up on incidents with the relevant agency and update record of all incidents as specified by the Incident Management System (IMS) in ITIS incident module.

The Contractor shall submit to the Engineer for approval, a curriculum vitae of the route patrol officer who must have previous road supervision experience, prior to being used in this capacity.

(b) The general duties of the route patrol shall be as follows.

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

The route patrol shall inspect the route reporting any damage to the road network or theft of road furniture including inter alia potholes, damaged guardrails, 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 shall also carry out the inspections for sections M2400 cleaning of culverts, M2500 cleaning of concrete drains, and M2700 edge build-up removal.

(ii) Temporary repair of potholes

The route patrol shall be responsible for the temporary repair of potholes with cold premix (Agrement certified), or a product approved by the Engineer.

The route patrol shall perform temporary pothole repairs immediately, unless otherwise instructed by the Engineer. The temporary repair must be done by removing loose material from the distressed area, backfilling with the cold premix and compacted to the specified density and in accordance with the provisions of M1202 repairs of potholes, edge breaks and surface failures. Separate payment for the procurement of material will be made under pay item M120.03. The route patrol shall capture required information using ITIS RRM mobile application.

(iii) Debris

The route patrol shall remove all foreign articles from the carriageway, which shall include inter alia any debris, spilled 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. All large objects that cannot be picked up by the team and excessive accident debris or large spilled loads shall be removed under daywork or the applicable pay items. The route patrol shall capture required information using ITIS RRM mobile application.

(iv) Signs and illegal signs

The route patrol shall perform temporary and minor sign repairs (i.e. re-align R and W series signs) where necessary.

The route patrol shall remove all illegal signs within the road reserve such as banners, posters and signs up to 0,5 m^2.

The route patrol shall capture required information using ITIS RRM mobile application.

(v) Minor fence repairs

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

The route patrol shall capture required information using ITIS RRM mobile application.

(vi) Accidents and traffic incidents

Any accidents or traffic incidents shall be reported to the relevant authority according to the Road 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. All accidents will be captured using ITIS Incident Mobile Application.

(vii) Assistance to motorists

The route patrol shall 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.

(viii) Veld fires

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

(ix) Statutory control

The route patrol 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

(x) Alien Vegetation

The contractor shall be responsible to train the DEO and route patrol person in the identification of alien vegetation and submit the following reports, identifying the species, infestation density and location to the engineer.

- A report within the first two months after commencement of the contract.
- Annually 1 month before the start of the annual alien vegetation eradication.
- Annually two weeks after the completion of the annual alien vegetation eradication.

The report reference must be the blue km marker boards, which side of the road, the plant type observed and a photo of the plant.

(xi) Inspection reports

The contractor shall as part of his route patrol duties, inform the Engineer compliance with the following specifications:

- PM2401
- PM2501
- PM2701

(xii) Video recordings

The contractor shall as part of his route patrol duties, and whenever route patrol is travelling on route, continuously record the route with an approved dashcam. The daily video recordings must be downloaded and every recording must be available on request for at least a month.

At least one recording per month of the project, total length of the road sections, must be archived on an external hard drive storage, supplied by the contractor. The video shall be in format approved by SANRAL, the video image shall be overlaid with a GPS date, time and location stamp. The monthly recording must be submitted to SANRAL on monthly basis for upload into ITIS.

The additional maintenance duties are in addition to the general duties of the route patrol and shall be as follows.

(i) Debris

The route patrol shall clean and remove all debris and litter from all formal stopping areas, informal stopping areas, lay byes, and intersections at least once a week during patrols.

The route patrol shall sweep all the surfaced access bell-mouths along the road on a rotation basis or after gravel has been washed onto the road. All loose aggregate stones, gravel and sand will be removed and disposed of alongside the road surface. The planning of this activity shall be such that all surfaced bell-mouths are cleaned at least once every three months.

(ii) Small spillages

The route patrol shall be responsible for the emergency cleaning of small spillages on the route, which are not hazmat spills requiring specialised cleaning up, and shall be performed immediately, unless otherwise instructed by the Engineer.

(c) Route patrol

The route patrol shall consist of a patrol vehicle, equipment and personnel. If additional maintenance patrol duties are specified, in the Project Specifications, additional personnel and equipment may be required. The minimum requirements in respect of the patrol vehicle, equipment and personnel to be supplied by the Contractor are as follows.

(i) Route patrol vehicle

The route patrol vehicle shall be a LDV with a minimum load capacity of 1 ton. The vehicle shall be fitted with a hazard light with a minimum intensity of 100W visible in all directions. The word ROUTE PATROL, 210 mm in height, shall be written in letters clearly legible during both daylight and night on both sides and the rear of the LDV.

The route patrol vehicle shall be dedicated and shall not be used for any other purposes during the performance of the route patrol.

(ii) Route patrol equipment

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

i. Fire extinguisher, 9 kg
ii. 10 x day-glow orange cones
iii. Shovel / broom, fire swatter
iv. Set of tools and battery jumper leads
v. Compaction device for potholes repair
vi. Cans for fuel, oil and water
vii. Spotlight (removable)
viii. Basic emergency spares such as fan belts, tyre repairs kits and tow ropes

ix. Warning signs (as specified)
x. Basic fence and sign repair materials for minor repairs
xi. Safety jackets (as specified)
xii. Plastic bags for rubble
xiii. Dedicated mobile phone with a suitable camera.
xiv. Two TW336 Warning signs, 1200 mm
xv. Stepladder, at least 2,4 m high
xvi. GPS providing detailed log of trip
xvii. First Aid kit
xviii. Dash board video camera and enough disk space storage as specified in the Project Specifications.

(iii) Route patrol personnel

The route patrol personnel shall consist of a route patrol officer, who shall be a competent driver capable of providing a high standard of service according to the requirements, plus a labourer for assistance.

(d) Reporting of daily records

The Contractor shall submit using ITIS RRM mobile application to the Engineer a daily record of any damage to the road network and work executed by the route patrol. 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.

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

M0403 MEASUREMENT AND PAYMENT

Item		Unit
M040.01	Route patrol	month

The unit of measure shall be the month for providing the route patrol service.

The tendered rates shall include full compensation for providing the route patrol service specified for weekdays, weekends and public holidays from 07:00 in the morning to 17:00 in the evening, or as specified including the vehicle, equipment and personnel required, and costs associated with the disposal of the foreign articles. The tendered rates shall also provide for all reporting including use of ITIS mobile applications, notifications and follow up of relevant incidents, and keeping of records thereof.

Item		Unit
M040.02	Temporary repair of potholes	month

The unit of measurement shall be the month 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 transporting 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.

Item		Unit
M040.03	Procurement and implementation of visual capturing devices for route patrol services	

(a)	Procurement and implementation of visual capturing devices for route patrol services	provisional sum (PS)
(b)	Overhead charges and profit on sub item M040.03 (a)	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.

SERIES M0000: GENERAL

SECTION M0500: ACCOMMODATION OF TRAFFIC

CONTENTS

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. This section also covers the requirements and duties of the traffic safety officer.

M0502 GENERAL REQUIREMENTS

(a) 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.

The Contractor will not be responsible for the provision of temporary road signs for work undertaken by specialist subcontractors inter alia road marking, mill and replace repairs, and repairs to structures, as the provision of temporary road signs will be included as part of the scope of work in the subcontracts. In addition, the Contractor may be required to provide temporary road signs for visual inspections, materials testing and survey work, but payment for this will be made from dayworks.

(b) Traffic Safety Officer

(i) General Duties

The Contractor shall designate in writing a Traffic Safety Officer (TSO) who shall be the responsible person to fulfil all the duties for the arrangements and maintenance of all accommodation of traffic measures required for the duration of the contract. In addition, each team shall have a Traffic Safety Representative (TSR) designated in writing, who shall be the responsible person for the arrangements and maintenance of all accommodation of traffic measures required for the respective team.

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.

The Traffic Safety Officer shall have undergone accredited training in the identification of hazardous materials, traffic safety and traffic accommodation. He is required to be a dedicated person on site and shall be full-time available and on standby after hours.

The Traffic Safety Officer shall confirm on neat and dimensioned layout sketches and date-stamped photographs, and submit to the Engineer, the position and sign reference number where applicable of each sign, barricade, delineator, cone, amber,

flicker light, guardrail 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 controls 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 every day 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.

(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 100 W. A warning board shall be displayed on the vehicle to be clearly visible, which shall be 250 mm high and display the word TRAFFIC CONTROL in bold black letters on a yellow reflective background material.

The Traffic Safety Officer shall carry first aid equipment at all times in the vehicle. The vehicle shall be equipped with a cellular phone and car kit and be on the Contractor's site radio net where applicable. 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 Traffic Safety Officer shall liaise directly with the Engineer regarding matters relating to the control of traffic.

(iii) Accidents

The Contractor shall participate in the Road Incident Management System (RIMS) for the route. The Traffic Safety Officer shall also be responsible for contacting the Centralized Communication Centre in accordance with Road Incident Management System protocol 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 Traffic Safety Officer shall capture all available information on incidents and accidents at the site using the ITIS Incident Mobile Application and upload these to the Employer's Incident Management System for verification by the Engineer. The Contractor shall participate in the Road 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.

(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 Traffic Signs Manual. Figures

13.37.1 and 2 must include 4 flagmen, 2 in each direction 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 reuse. 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 Traffic Signs 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.

Traffic shall 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 include 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 Specifications 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.

The basic minimum clearance for the R, W and G Series shall be 800 mm 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 drawings, 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 flagmen for each work area during the daytime as specified in the drawings. Each flagman must have a red flag with the minimum size of 600 mm x 600 mm 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.

(i) All vehicles and items of mobile equipment operating on site shall comply with the Construction Regulation 21(1 and 2) and be supplied with electrically operated amber rotating/led (Light Emitting Diode) warning lights of robust construction which shall be flashing when the vehicle is on site accept when parked at the office. The amber lens shall have a height of at least 150 mm and an output of at least 100 W. The beacons shall be so placed as to be clearly visible from all directions from a distance of 300 m.

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 displayed on the vehicle to be clearly visible, which shall be 210 mm high and display the word MAINTENANCE in bold black letters on a yellow reflective background material.

In addition, all powered vehicles used on the contract shall be identifiable and have sign boards mounted on the side of the vehicle. These boards shall be displayed on the vehicle to be clearly visible, which shall display the Contractors name in bold black letters on a white background material.

(j) The Contractor shall provide at the Contractor's expense, reflective waistcoats and overalls, 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 300 m, measured at a height of 1,05 m from the road surface, is obtained.

(iv) The sign stands and foot pieces shall be sufficiently robust and be large enough to enable the signs to be sufficiently ballasted to prevent the signs from being blown over by wind or air disturbance caused by passing vehicles.

(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 furthermost 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 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 2 km.

(ii) The minimum gap between closures shall be 3 km.

(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 Specifications is applicable. The Contractor will not be allowed to continue with any work until the accommodation of traffic complies with the specifications.

Penalties shall be applied where temporary road signs have been left in place and are not applicable. The penalty as specified in the Project Specifications is applicable.

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.

(p) Quality of signs

Signs are to be treated with due care and signs are to be stacked vertically with spacers at all times. Signs are to last at least 18 months. Replacement of damaged signs within the specified 18 months will be at the Contractor's own cost, unless the

Contractor can provide evidence of unforeseen circumstances that resulted in the deteriorating of the signs sooner than anticipated and therefore need to be replaced.

M0503 MATERIALS

(a) Steel plate

Steel plate for road signs shall be 1,40 mm thick pre-painted galvanised steel plate (chromadek) which has been treated on both sides with an epoxy primer followed by a silicone polyester top coat. The reverse side of the sign shall be dark grey, and for a STOP sign it shall be white.

(b) Steel profiles

Standard sign profiles shall be 200 mm sections with a thickness of 1,0 mm, manufactured from pre-painted galvanised mild steel substrate (chromadek), and shall comply with the drawings. The reverse side of the sign shall be dark grey.

(c) Sign face material

The retro-reflective material shall comply with SANS 1519 and the grade of material required is specified on the drawings.

M0504 MEASUREMENT AND PAYMENT

M0500 ACCOMMODATION OF TRAFFIC

Item		Unit
M050.01	Provision of temporary traffic control facilities	
(a)	Portable STOP/GO signs: 750 mm	number (No)
(b)	Road signs: R- and TR-series	
	(i) 1200 mm	number (No)
	(ii) 900 mm	number (No)
(c)	Road signs: TW-series	
	(i) 1500 mm	number (No)
	(ii) 1200 mm	number (No)
(d)	Rectangular road signs: TGS-, TIN- and TW-series (excluding delineators and barricades)	square metre (m^2)
(e)	Delineators:	
	(i) 1000 mm x 250 mm	number (No)
	(ii) 800 mm x 200 mm	number (No)
	(iii) Solid rubber moulded heavy duty Bases for (e) (i)	number (No)
	(iv) Solid rubber moulded heavy duty Bases for (e) (ii)	number (No)
(f)	Barricades:	
	(i) 2400 mm x 400 mm	number (No)
	(ii) 1800 mm x 300 mm	number (No)
(g)	Traffic cones: 750 mm	number (No)

The unit of measure shall be the number or square metre of each type of traffic control facility provided.

The tendered rate shall include full compensation for the provision of all temporary traffic control facilities required to do the maintenance work, including posts, stakes, portable stands and

sandbags as may be required. The tendered rate shall also include full compensation for providing the necessary traffic control facilities to subcontractors, but exclude the requirements for specialist subcontractors such as road marking, mill and replace repairs, and repairs to structures, who shall provide their own requirements.

Item		Unit
M050.02	Accommodation of traffic and maintaining temporary deviations	
(a)	General Provisions	month
(b)	Work undertaken by contractor	month
(c)	Work undertaken by subcontractor	month
(d)	Traffic Safety Officer	month

The tendered rate per month under sub-item M050.03 (a) shall include any ongoing costs of the Contractor for the provision of traffic accommodation general requirements, excluding any traffic accommodation for work zones. The tendered rate shall also include the storage and other costs of the Contractor for the traffic control facilities to be issued to the subcontractors.

The tendered rate per month under sub-item M050.03 (b) shall include full compensation for all costs associated with the accommodation of traffic and maintaining temporary deviations, including any cost associated with the provision of flagmen, for the work undertaken by the Contractor himself. The tendered rate shall also include full compensation for all costs for transporting to site, erection and removal, cleaning and maintenance, covering with non-transparent material when not required. It shall also include the costs of the Contractor for the loss, theft or damage over and above normal wear and tear of the temporary traffic control facilities. 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 per month under sub-item M050.03 (c) shall include full compensation for all costs associated with the accommodation of traffic and maintaining temporary deviations, including any cost associated with the provision of flagmen, for the work undertaken by subcontractors, which will be included in the subcontracts. The tendered rate shall also include full compensation for all costs for transporting to site, erection and removal, cleaning and maintenance, covering with non-transparent material when not required. It shall also include the costs of the subcontractor for the loss, theft or damage over and above normal wear and tear of the temporary traffic control facilities, and the cost of any guarantee which the Contractor is entitled to request as security for providing temporary traffic control facilities to the subcontractor. It shall exclude the cost of providing temporary traffic control facilities which the Contractor shall be responsible for."

The tendered rate per month under sub-item M050.03 (d) shall include full compensation for the provision of a full-time Traffic Safety Officer and for all the duties performed by the Traffic Safety Officer, and the equipment needed.

Measurement and payment shall be in accordance with the provisions of subclause 13.5 of the FIDIC Conditions of Contract for Construction, 1999.

Item		Unit
M050.03	Supply and use of truck-mounted attenuators	Month

The unit of measurement will be the month for the duration of the contract. The tendered rate shall include full compensation for the procurement, installation to a specified truck and the use of 4 truck-mounted attenuators for all traffic accommodation.

Item		Unit
M050.04	Additional lane closures	Number (No)

The unit of measurement will be the number of additional lane closures, regardless of the lane position, as instructed by the engineer.

The tendered rate shall include full compensation for all costs associated with the accommodation of traffic and maintaining temporary deviations, including any cost associated with the provision of flagmen, for additional lane closures as instructed by the Engineer. The tendered rate shall also include full compensation for all costs for transporting to site, erection and removal of temporary signage.

SERIES M0000: GENERAL

SECTION M0600: OVERHAUL

CONTENTS

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, M2400, M2500, M2600, M2700, 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 borrow before excavation, and the centre of the volume of the overhaul material constructed in fill or spoiled.

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 0,1 km.

(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 1,0 km.

(d) Overhaul distance

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

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, unless otherwise specified.

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

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.

It involves the excavation of the existing failed areas and reconstructing the pavement and surfacing layers with specified pavement materials, 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.

The area of such local repair may vary in size and shall be indicated by the engineer. The contractor may carry out the excavation in the existing pavement layers either by hand with the aid of jackhammers and saw cutting machines or with a milling machine, depending on the size of the repair and the extent of repair work required. Front end loaders or TLB's may not be used for breaking up and excavating the existing pavement, but may be used to assist with the loading of the excavated material into trucks.

Compensation for work in restricted areas shall not be applicable.

The work shall be undertaken by competent subcontractors with relevant pavement layer repair and surfacing experience.

M1102 EXECUTION OF WORK

a) Removal of distressed areas

(i) General

The Engineer will demarcate any failed areas to be repaired, and shall instruct the Contractor with regards to the repair work to be carried out. 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 side slopes 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 150 mm.

(ii) Removal of distressed areas by milling

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.

The floor of the milled excavation shall, before the application of the tack coat, be cleaned of all loose material by brooming, blowing with compressed air or vacuuming or any other method that will produce an exposed surface that is closely-knit, firm and stable, free of nests of segregated materials, laminations or corrugations.

Where milling is to be done at existing structures, care shall be exercised to avoid damage to concrete elements, expansion joints, nosings to expansion joints, manholes, catch pits etc. Damage caused to any element forming part of the permanent works shall be repaired at the contractor's cost.

Milled excavations shall not be left open to traffic, however in instances where this cannot be avoided, longitudinal and transverse joints must be treated. Where the difference in level between the floor of the milled excavation and the existing road surface exceeds 25mm, transverse steps shall be tapered off at a slope of 1 vertical to 20 horizontal (1:20) and longitudinal joints exposed to traffic shall be tapered to a slope of 1 vertical to 5 horizontal (1:5). An alternative method using a compacted asphalt wedge of the same dimensions is acceptable

(iii) In-situ milling / recycling

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 37,5 mm.

Where specified in the Project Specifications or instructed 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 in-situ, 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.

(iv) Excavation

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 area being repaired. The stockpiled material shall be reused 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 reuse 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:

Surface	(up to 40 mm above final base layer) Asphalt: 97% minus % voids in approved production mix of Theoretical Maximum Relative Density (TMRD)
Base	(0 – 150 mm below final base level) Cement stabilised crushed stone: 98% of Mod AASHTO maximum dry density Emulsion-treated crushed stone (ETB):100 of Mod AASHTO maximum dry density Asphalt base material (BTB): as specified in subclause M1102 (b)(iii)
Subbase	(150 mm – 300 mm below final base level) 95% of Mod AASHTO maximum dry density
Selected	(300 mm – 600 mm below final base level) 93% of Mod AASHTO maximum dry density
Fill	(Below 600 mm of final base level) 90% of Mod AASHTO maximum dry density

Backfilling of the excavation shall be done as follows:

(i) Where required by the Engineer, fill and selected material shall be obtained from an approved borrow pit or commercial source as backfilling for pavement layers.

(ii) The Engineer may instruct the Contractor to use stabilised or unstabilised natural gravel material excavated from the existing pavement or imported from an approved borrow pit or commercial source, as backfilling, either for subbase layers only or for both subbase and base layers.

Material shall be broken down and 65kg/m^3 of the Mod AASHTO maximum dry density of the unstabilised material of cement (CEM II 32,5) 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.

(iii) Where required by the Engineer, backfilling for the base layer shall be done with crushed stone material excavated from the existing pavement or imported from a commercial source to supplement the excavated material, of G3 or better quality, treated with bitumen emulsion. CEM II-32,5 cement shall be added at a rate of 1% by mass of the Mod AASHTO maximum dry density of the crushed stone material and mixed off the road by means of a concrete mixer. Mixing by hand will not be allowed by the Engineer. All mixing must 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 60% stable-grade bitumen emulsion at a rate of 3% nett bitumen by mass of the Mod AASHTO maximum dry density of the crushed stone material. 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, 0,6 litres/m^2 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.

(iv) Where required by the Engineer, the reinstatement of the bituminous surfacing, following backfilling of the base layer shall be done with continuously graded medium grade asphalt as specified hereinafter, to a compacted thickness of 40 mm $\pm$10 mm. Where the supply of hot mix asphalt is problematic, cold mix asphalt which conforms to the specifications of M1105(f) may be utilised, as agreed with the Engineer in writing.

The rates of application and mix proportions of bituminous binder, aggregates and fillers which are given in Table M1105/5 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 on the relevant D3 form (from TMH 10) 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. All the expenses in preparing and submitting the laboratory design mix shall be to the contractor's cost. 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.

Asphalt mixes shall be manufactured using different individual single size coarse aggregates fractions and crushed fine aggregates blended to conform to the specified grading requirements. The use of natural sands shall only be permitted if approved by the engineer and shall be limited to a maximum of 5% for continuously graded mixes.

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 M1105/5.

The design of the asphalt mixes shall be in accordance with the design guidelines of Interim Guidelines for the Design of Hot-Mix Asphalt in South Africa (June 2001) and appropriate research results and the mix properties and requirements shall be specified in the Project Specifications. In addition to the design guidelines of Interim Guidelines for the Design of Hot-Mix Asphalt in South Africa (June 2001), the asphalt mixes shall also comply with the requirements in Table M1105/1 unless otherwise stated in the Project Specifications.

Where backfilling material consists of any bituminous based products, the floor and sides of the prepared excavation shall be treated with a bond coat consisting of a diluted 60% stable grade anionic bitumen emulsion (50/50) and applied at a nominal rate 0,5 l/m². The bond coat shall be applied by means of an approved pressurised sprayer, hand sprayer or paint brush, or a combination thereof, dependant on the specific dimensions of the patch. The Tack coat shall be applied to all transverse and longitudinal joints by hand utilizing a paint brush.

The use of an asphalt paver is required for the paving of areas larger than 50 m^2.

The mix shall be rolled by as soon as possible after it has been laid by means of approved flat steel-wheeled, vibratory or pneumatic-tyred rollers. The frequency as well as the amplitude of vibratory rollers shall be adjustable. Vibratory rollers shall be used only where there is no danger of damage being done to the asphalt, and to the smoothness of the layer, as well as bridge decks, or other.

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 5 km/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 SANS 3001 method AS11.

The Contractor shall utilise a calibrated nuclear gauge for process control during compaction operations. The responsibility in achieving the minimum specified compaction remains with the contractor. Notwithstanding this requirement, the acceptance control carried out for compaction by the Engineer shall still be based on cores taken from the compacted layer. Cores shall only be drilled when the road temperature is 20^0C or less. Core holes shall be filled with hot mix asphalt and compacted, all within 24 hours of the core being drilled. Coring

shall be carried out within 48 hours after the paving has been completed and supplied to the engineer. Furthermore, the following shall be applicable

(i) Cracks or hair line cracks shall not be formed and the bond with the underlying layer shall not be broken.

(ii) The density shall be uniform over the whole area of the layer and extend over the full depth of the layer.

(iii) 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.

The contractor shall keep accurate records of:

(iv) The position where every truckload of asphalt is paved (chainage, lane, time and date).
(v) The temperatures of the asphalt at the paving equipment immediately prior to discharging the load.
(vi) The truck and load number from which control samples are taken. All samples taken shall be appropriately numbered

(v) 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.

(vi) 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 40 mm ± 10 mm 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 comply with the SARTSM Vol 2 figure 13.44 as approved by the Engineer. No area that is to be prepared shall be left exposed if rain is imminent.

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

In the unlikely event that the surfacing of a repair area cannot be completed due to unforeseen circumstances, the Contractor must treat the vertical drop in the surfacing as follows:

- Temporary material for safeguarding traffic against the unexpected drop in surface must be cold mix asphalt compacted in place.
- Transverse steps (in the direction of traffic movement) shall be tapered at a rate of 1 vertical to 20 horizontal (1:20).
- Longitudinal steps shall be tapered at a rate of 1 vertical to 5 horizontal (1:5).

(d) Testing

The Contractor shall comply with the minimum test frequencies as specified in the Project Specifications. 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

Modified AASHTO densities shall be determined using SANS 3001 Method GR31 Maximum dry density (MDD) of stabilised materials and Method GR30 .Maximum dry density of unstabilized material.

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 3 mm. 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 40 mm ± 10 mm.

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 3 m straight edge laid parallel to the road centreline the surface within the wheel path (if applicable) of the area shall not deviate from the bottom of the straight edge by more than 5 mm. The 3m straight-edge shall be placed in such a way that for a measured line each measurement shall overlap by at least 500mm with the previous measurement."

The results of all relevant tests (accredited laboratory tests and on-site tests using the RCCD or DCP) must indicate compliance with the specified requirements and be to the satisfaction of the Engineer.

Any corrective work required shall be made by the removal of the total repaired area in question, followed by reinstatement. Corrective work shall not commence until the engineer has approved the contractor's method statement. Corrective work shall be done at the contractor's expense.

Any repaired areas identified during the Employers automated pavement condition surveys to deviate statistically from roughness parameters from adjacent non repaired areas, will be required to be corrected at the contractor's expense. Corrective work shall not commence until the engineer has approved the contractor's method statement.

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 200 mm in one operation without fragmenting the material, and in straight lines within the required tolerances.

To minimize temperature loss all vehicles used for transporting hot asphalt to the site shall be fitted with thermal asphalt covers (canvas covers not acceptable) irrespective of the prevailing climatic conditions or distance of transport.

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

(i) A sit on vibratory roller having a minimum mass of 1.5ton, with an adjustable amplitude and frequency of vibration.

(ii) A mobile compressor capable of producing at least 3 m^3/minute compressed air at 750 kPa.

(iii) Appropriate paving breakers.

(iv) Approved milling machine if required. Note: The use of a milling machine on site is deemed necessary for the milling of areas larger than 50 m^2. The milling machine 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 specification. The milling depth shall be controlled electronically.

(v) Approved pavers if required. Note: The use of an asphalt paver is required for the paving of areas larger than 50 m^2. The paver shall be a self-propelled mechanical spreader and finisher capable of laying asphalt to the required widths, thicknesses, profile, camber or cross-fall, without causing segregation, dragging or other surface defects. All pavers shall be fitted with automatic electronic screed controls to maintain the required levels, cambers and cross-falls.

(vi) Pneumatic compactors as required

(vii) 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 SANS 1083 in general and Table M1105/1, Table M1105/2 and Table M1105/3:

TABLE M1105/1: 10% FINES AGGREGATE CRUSHING VALUES

ROCK TYPE	MATRIX	DRY MIN	WET MIN	WET/DRY RELATIONSHIP MIN
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%

TABLE M1105/2: AGGREGATE CRUSHING VALUE

ROCK TYPE	ACV MAX
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
	G3
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 SANS 3001 method AG10, should be not less than the appropriate value in Table M1105/1, column 3. The Aggregate Crushed value (ACV), determined in accordance with SANS 3001 method AG10, 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 –28 + 20 mm fraction and the –20 + 14 fraction

Fractured faces		For crushed materials at least 50% by mass of the fractions retained by each standard sieve 4,75 mm and larger shall have at least one fractured face
Atterberg Limits	Fraction (mm)	LL shall not exceed 25 PI shall not exceed 6 LS shall not exceed 3% In case of calcrete the PI shall not exceed 8 (% passing 0,425 mm sieve) LS $\leq$ 170
	-0,425	
	-0,075	If chemical modification is required the PI of the –0,075 mm fraction after modification shall not exceed 10
Soluble Salts		See additional requirements
Nominal Maximum Size		28 mm
Grading	Nominal aperture size of sieve (mm)	Percentage passing sieve, by mass
	37,5	
	28,0	100
	20,0	87 – 96
	14,0	73 – 86
	5,0	43 – 61
	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

Cement shall comply with the relevant requirements of SANS 50197-1:2000. The use of strength classes greater than 32,5 shall not be permitted.

On this contract CEM II 32,5 shall be used for stabilization purposes.
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(c) Hot mix Asphalt Base and surfacing mix requirements

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

TABLE M1105/4: PROPERTIES FOR CONTINUOUSLY GRADED ASPHALT BASE AND SURFACING

Property	Continuously graded base mixes	Continuously graded surfacing mixes
Marshall Stability (kN)	8 – 18	8 – 18
Marshall Flow (mm)	2 – 6	2 – 6
Stability /Flow (kN/mm)	>2,5	> 2,5
VMA (%)	> 14	> 15
VFB (%)	65 – 75	65 – 75
Air voids (%)	4 – 6	4 – 6
Indirect tensile strength @ 25^{o}c (kPa)	> 1000	> 1000
Dynamic Creep Modules @ 40^{o}C (MPa)	> 20	> 20
Modified Lottmann* (TSR)	> 0,7	> 0, 8
Air permeability @ 7% voids (cm^2)	< 1 x 10 $^{-8}$	< 1 x 10 $^{-8}$
Binder film thickness (microns)	5,5 – 8,0	5,5 – 8,0

TABLE M1105/4: PROPERTIES FOR CONTINUOUSLY GRADED ASPHALT BASE AND SURFACING		
Property	**Continuously graded base mixes**	**Continuously graded surfacing mixes**
Absorbsion (Binder)	< 0.5	< 0.5
Filler bitumen ratio	1 – 1,5	1 – 1,5
Immersion index (%)	–	–

The binders to be used shall be as follows:

a) Continuously graded surfacing course: 50/70 penetration grade bitumen.
b) Continuously graded base: 30/50 penetration grade bitumen.

All penetration grade bitumen is to comply with the requirements of SANS 4001-BT1.

Grading limits and mix proportions are given in Table M1105/*5*.

TABLE M1105/5: GRADING LIMITS AND MIX PROPORTIONS FOR CONTINUOUSLY GRADED ASPHALT BASE AND SURFACINGS			
PERCENTAGE PASSING THROUGH SIEVE BY MASS			
SIEVE SIZE (mm)	**ASPHALT BASE**	**ASPHALT SURFACING**	
	28,0 mm MAX	**MEDIUM**	**FINE**
53,000	–	–	–
37,500	–	–	–
28,500	100	–	–
20,000	87 – 96	–	–
14,000	73 – 85	100	
10,000	64 – 79	85 – 100	100
7,000	–	–	–
5,000	43 – 61	56 – 77	66 – 89
2,000	28 – 44	33 – 48	42 – 59
1,000	20 – 35	25 – 40	31 – 51
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
NOMINAL MIX PROPORTIONS (BY MASS)			
Aggregate	94,5 %	93,5 %	93,0 %
Bitumen	4,5%	5,5 %	6,0%
Active filler	1,0 %	1,0 %	1,0 %

The active filler shall be hydrated lime, unless otherwise approved by the Engineer.

The combined aggregate and filler grading shall not deviate from the approved target grading for the working mix by more than that given in table M1105/6 below:

TABLE M1105/6: AGGREGATE GRADING TOLERANCES	
Size of aggregate passing Sieve size (mm)	**Permissible deviation from target grading (%)**
28	± 5
20	± 5
14	± 5
10	± 5
7	± 5
5	± 4
2	± 4
1	± 4

TABLE M1105/6: AGGREGATE GRADING TOLERANCES	
Size of aggregate passing Sieve size (mm)	**Permissible deviation from target grading (%)**
0,600	± 4
0,300	± 3
0,150	± 2
0,075	± 1*

* When statistical methods are applied the permissible deviation for the 0,075 fraction is ± 2%.

(d) Cold premixed bituminous mixture "cold mix asphalt"

Cold mix asphalt is an asphalt mix, generally including a proprietary agent that has been pre-mixed in a mixing plant, packaged and stored for future applications at ambient temperatures. The cold mix products is prescribed as being fit for purpose for the specific application as certified by an approved independent certification agency. Such Certification Agency may be Agrèment SA, or any other accredited facility, as approved by the Employer.

In areas where the availability or supply of hot mix asphalt is problematic, surfacing of pavement layer repairs with "coldmix asphalt" may be ordered by the Engineer.

(e) Primes and tack coats for asphalt

The binders to be used for priming and tacking the excavated area shall be as follows:

Anionic bitumen emulsion – complying with SANS 4001 – BT3
Cationic bitumen emulsion – complying with SANS 4001 – BT4
Invert bitumen emulsion – complying with SANS 4001 – BT5

Unless otherwise specified in the project documentation, the tack/bond coat for asphalt surfacings, shall consist of a stable grade bituminous emulsion diluted to have a 30% net bitumen content.

M1106 MEASUREMENT AND PAYMENT

Item		Unit
M110.01	Removing and excavating material from existing pavements (except milled material)	
(a)	Areas up to 50 m²	cubic metre (m³)
(b)	Areas exceeding 50 m² up to 100 m²	cubic metre (m³)
(c)	Areas exceeding 100 m²	cubic metre (m³)

The unit of measurement shall be the cubic metre of material, except milled material, excavated from the existing pavement irrespective of the depth and type of material. Payment will not distinguish between the different types of pavement layer and surfacing material excavated. The quantity shall be computed in accordance with the authorised dimensions of the excavation. Distinction shall be made for the size of area excavated.

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

Item		Unit
M110.02	Milling out material from existing pavements	

(a)	Not exceeding 30 mm	cubic metre (m^3)
(b)	Exceeding 30mm but not exceeding 60mm	cubic metre (m^3)
(c)	Exceeding 60mm but not exceeding 150mm	cubic metre (m^3)
(d)	Exceeding 150mm but not exceeding 250mm	cubic metre (m^3)
(e)	Exceeding 250mm but not exceeding 350mm	cubic metre (m^3)
(f)	Establishing of milling machine on site	number (No)
(g)	Moving the milling machine on site for distance exceeding 1,0 km	number (No)

The unit of measurement for subitems (a) to (e) shall be the cubic metre of material milled out from the existing pavement irrespective of the type of material. Payment will not distinguish between the different types of pavement material milled or the size of the repaired area. The quantity shall be computed in accordance with the authorised dimensions of the excavation.

The tendered rate for subitems (a) to (e) shall include full compensation for milling out the material to the specified depth and in accordance with the requirements for evenness and for all measurements, labour supervision and incidentals for executing the work and obtaining milled material which will comply with the specified requirements

The tendered rate shall also include full compensation for loading and transporting the material to an approved stockpile site or disposing of the material, including a free-haul of 1,0 km.

The unit of measurement for subitem (f) shall be the number of milling machines provided on site, or the number of times a milling machine is brought on the site where it had to be removed with the approval of the engineer.

Payment will not be made for replacing any defective plant. Additional machines will be paid for only with the approval of the engineer.

The unit of measurement for subitem (g) shall be the number of times a milling machine is moved for more than 5,0km, as may be approved or instructed by the engineer, in writing.

The tendered rate shall include full compensation for all costs involved in such moving, as well as for all delays and production losses. Payment will not be made for moving for the purpose of maintenance and repairs of for the replacement with another machine.

Item			Unit
M110.03	Backfilling of base layer failures with:		
(a)	Chemically stabilised gravel excavated from the existing pavement		
	(i)	Areas up to 50 m²	cubic metre (m³)
	(ii)	Areas exceeding 50 m² up to 100 m²	cubic metre (m³)
	(iii)	Areas exceeding 100 m²	cubic metre (m³)
	(iv)	Extra over subitems M110.03 (a) (i), (ii) and (iii) for importing gravel	cubic metre (m³)
(b)	Emulsion-treated crushed stone		
	(i)	Areas up to 50 m²	cubic metre (m³)
	(ii)	Areas exceeding 50 m² up to 100 m²	cubic metre (m³)
	(iii)	Areas exceeding 100 m²	cubic metre (m³)
	(iv)	Extra over subitems M110.04 (b) (i), (ii) and (iii) for importing crushed stone	cubic metre (m³)
(c)	Asphalt base (hot mix– continuously graded 28mm max.)		
	(i)	Areas up to 50 m²	ton (t)
	(ii)	Areas exceeding 50 m² up to 100 m²	ton (t)
	(iii)	Areas exceeding 100 m²	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 (BTB) constructed as specified. The quantity will be computed in accordance with the authorised dimensions of the layer in the case of gravel or crushed stone, and measured according to certified weighbridge tickets issued in respect of asphalt. There will be no payment for wasted material. Distinction shall be made for the size of area repaired.

The tendered rate shall include full compensation for all mixing, placing, trimming or cutting the edges of existing surfacing and pavement layers, compacting, including the floor, and finishing as specified, work in restricted areas, and also for all machinery, equipment, labour, supervision and other incidentals for executing the work as specified.

The tendered rate for chemically stabilised gravel for subitems M110.03 (a) (i), (ii) and (iii) shall include full compensation for providing the chemical stabilising agent, applying and mixing the stabilising agent, for the material excavated from the existing pavement and reused for backfilling. The tendered rate for subitem M110.04 (a)(iv) shall include full compensation for procuring and supplying imported approved gravel for backfilling irrespective of its origin.

The tendered rate for emulsion-treated crushed stone for subitems M110.03 (b) (i), (ii) and (iii) shall include full compensation for providing the bituminous stabilising agent, applying and mixing the stabilising agent, for the crushed stone excavated from the existing pavement and reused for backfilling. The tendered rate for subitem M110.03 (b) (iv) shall include full compensation for procuring and supplying imported crushed stone (min G3 quality) for backfilling irrespective of its origin.

Payment for hot mix asphalt base will not distinguish between the various types of asphalt and will allow for a tack coat.

Item			Unit
M110.04	Surfacing of base layer repairs with:		
(a)	Asphalt surfacing – (hot mix - continuously graded medium)		
	(i)	Areas up to 50 m²	ton (t)
	(ii)	Areas exceeding 50 m² up to 100 m²	ton (t)
	(iii)	Areas exceeding 100 m²	ton (t)
(b)	Cold premixed asphalt mixture “cold mix”		
	(i)	Areas up to 50 m²	ton (t)
	(ii)	Areas exceeding 50 m² up to 100 m²	ton (t)
	(iii)	Areas exceeding 100 m²	ton (t)

The unit of measurement for subitem (a) and (b) shall be the ton of asphalt constructed as specified and measured according to certified weighbridge tickets issued in respect of asphalt used. There will be no payment for wasted material. Distinction shall be made for the size of area repaired.

The tendered rate shall include full compensation for all material, irrespective of its origin, mixing, placing, trimming or cutting the edges of existing surfacing, compacting, including the floor, and finishing as specified, work in restricted areas, and also for all machinery, equipment, labour, supervision and other incidentals for executing the work as specified.

Payment for asphalt surfacing will allow for a tack coat.

Item		Unit
M110.05	Establishment and moving of asphalt paver on site	
(a)	Establishment of asphalt paver	Number (No)
(b)	Moving the paver on site for distance exceeding 5,0 km	Number (No)

The unit of measurement for subitem (a) shall be the number of pavers provided on site, or the number of times a paver is brought on the site where it had to be removed with the approval of the engineer.

Payment will not be made for replacing any defective plant. Additional machines will be paid for only with the approval of the engineer.

The unit of measurement for subitem (b) shall be the number of times a paver is moved for more than 5,0km, as may be approved or instructed by the engineer, in writing.

The tendered rate shall include full compensation for all costs involved in such moving, as well as for all delays and production losses. Payment will not be made for moving for the purpose of maintenance and repairs of for the replacement with another machine.

Item		Unit
M110.06	Backfilling of pavement layers	
(a)	Subbase layer	

	(i)	Areas up to 50 m²	cubic metre (m³)
	(ii)	Areas exceeding 50 m² up to 100 m²	cubic metre (m³)
	(iii)	Areas exceeding 100 m²	cubic metre (m³)
(b)	Selected layer		
	(i)	Areas up to 50 m²	cubic metre (m³)
	(ii)	Areas exceeding 50 m² up to 100 m²	cubic metre (m³)
	(iii)	Areas exceeding 100 m²	cubic metre (m³)
(c)	Fill layer		
	(i)	Areas up to 50 m²	cubic metre (m³)
	(ii)	Areas exceeding 50 m² up to 100 m²	cubic metre (m³)
	(iii)	Areas exceeding 100 m²	cubic metre (m³)

The unit of measurement shall be the cubic metre of compacted pavement layer.

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

Item		Unit
M110.07	Binder variation	
(a)	Penetration-grade bitumen	ton (t)
(b)	Anionic bitumen emulsion	litre (l)
(c)	Cationic bitumen emulsion	litre (l)
(d)	Invert bitumen emulsion	litre (l)

The unit of measurement for subitem (a) in respect of increases or decreases in the bituminous binder from that specified in the nominal mix for asphalt shall be the ton.

The unit of measurement for subitems (b) to (d) in respect of increases or decreases in the bituminous binder measured at spraying or mixing temperature shall be measured in litre.

Item		Unit
M110.08	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 will be made for “inert” filler added by the Contractor.

Item		Unit
M110.09	Overhaul on material hauled in excess of 1,0 km	cubic metre kilometre (m³.km)

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

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

Item		Unit
M110.010	Milling and paving	
(a)	Milling and paving	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M110.01(a)	percentage (%)

This item is for the milling and paving of large sections of pavement layers by a specialist subcontractor on the instruction of the Engineer.

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 subitem M110.01 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M110.11	100mm cores in asphalt paving	Number (No)

The unit of measurement shall be the number of 100mm cores drilled and recovered as instructed by the engineer for his own testing. No separate payment shall be made for cores drilled as part of the contractor's obligations under process control, the cost of which shall be included in the prices tendered for the various items of asphalt paving.

The tendered rate shall include full compensation for drilling the cores as directed, for all plant, fuel, labour and other incidentals necessary and for repairing.

SERIES M1000: PAVEMENT MAINTENANCE

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

CONTENTS

M1201 SCOPE

This section covers the repair of potholes, edge breaks and surface failures on surfaced roads excluding concrete pavements.

The work shall either be executed on instruction or on a performance based basis as specified in the Project Specifications.

M1202 DEFINITIONS

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 m^2. Potholes are isolated and are not associated with displacement. Potholes with areas larger than 0,5 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 300 mm from the continued edge of the surfacing usually accompanied by a loss of gravel on the shoulder. Edge breaks wider than 300 mm will be treated as pavement failures.

Surfacing failures 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. Surfacing failures with areas larger than 2 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 by the route patrol or if instructed or authorised otherwise by the Engineer.

M1203 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

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

(ii) 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 30 mm below the road surface.

Where the existing edge of the surfacing is sound and undamaged, but the required surfacing width is exceeded by more than 50 mm, the excess surfacing shall be cut back, parallel to the centre line of the road, to the required width. Where the edges of the surfacing is fragmented or where the surfacing is narrower than the required width, it shall be cut back to a line along which a sound edge can be obtained. These lines shall be parallel to the centre line of the road and may not exceed the required width.

Where the surfacing, after having been cut back, is narrower than the specified width, the pavement material between the cut edge and the specified surfacing edge shall be excavated to a depth of 60 mm below the final road surface, or until firm material is found.

(iii) Surfacing failures: The surface repair shall be saw cut to a minimum depth of 30 mm below the road surface and shall have a neat rectangular shape, parallel and at right angles to the direction of traffic. Before starting any repair work the areas adjacent to the holes should be checked for de-bonding by tapping the surface with a hammer. A dull sound indicates lack of bond. De-bonded material must be removed and can be lifted off with a flat spade.

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

(b) Backfilling

(i) Potholes and edge breaks: After completion of the excavation of potholes and edge breaks, 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 diluted stable grade anionic bitumen emulsion (50/50) and applied at a nominal rate 0,5 l/m². The Contractor shall arrange the work so as to allow enough time for the emulsion to break before asphalt can be placed.

The asphalt shall be placed in layers not exceeding 40 mm in thickness after compaction, and compacted to the level of the existing adjacent surfacing. The asphalt shall be compacted as specified in section M1100: Pavement Layer Repairs.

(ii) Surfacing failures should be well cleaned (if contaminated with fumes by washing) and a tack coat of diluted stable grade anionic bitumen emulsion (50/50) and applied at a nominal rate 0,5 l/m² (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 Hot Mix asphalt (continuously graded medium). Where the supply of hot mix asphalt is problematic, cold mix asphalt which conforms to the specifications of M1105(f) may be utilised, as agreed with the Engineer in writing.

The composition and compaction requirements for asphalt surfacing shall be as specified in section M1100: Pavement Layer Repair.

(c) Non-performance based criteria

The Contractor shall as part of his duties, inform the Engineer of any potholes, edge breaks and shoulder failures.

The Engineer shall then instruct the Contractor regarding the repair of such potholes, edge breaks and shoulder failures.

Notwithstanding the preceding, the Engineer may also at any time instruct the Contractor to repair of such potholes, edge breaks and shoulder failures.

(d) Performance based criteria

All potholes, edge breaks and surface failures shall be repaired after detection by the contractor/route patrol or notification thereof by the Engineer.

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 3 mm. 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 40 mm ± 10 mm.

The cross fall 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 3 m 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 5 mm.

Any corrective work required shall be made by the removal of the total repaired area in question, followed by reinstatement. Corrective work shall not commence until the engineer has approved the contractor's method statement. Corrective work shall be done at the contractor's expense.

(b) Acceptance criteria

(i) Non-performance based criteria

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

Edge breaks: Edge breaks must be repaired within 14 days after instruction from the Engineer or detection by the route patrol/contractor

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

(ii) Performance based criteria

The minimum standard on potholes, edge breaks and surface failure is:

Potholes: Not more than 2 potholes with a diameter greater than 100 mm on any continuous 10 km of carriageway length.

Edge breaks: Not greater than 50 metres of edge breaks on any continuous 10 km of carriageway length where the width of the edge break exceeds 100 mm.

Surface failures: Not more than 2 surface failures on any continuous 10 km of carriageway length.

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 200 mm 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:

(i) A vibratory roller shall having a minimum mass of 1,5ton, with an adjustable amplitude and frequency of vibration.

(ii) A mobile compressor capable of producing at least 3 m^3/minute compressed air at 650Pa.

(iii) Appropriate paving breakers.

(iv) Manually operated pneumatic compactors as required.

(v) 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.

The pothole material used by the route patrol for the temporary repair of potholes shall be a cold mix asphalt product which is prescribed as being fit for purpose for the specific application as certified by an approved independent certification agency. Such Certification Agency may be Agrèment SA, or any other accredited facility, as approved by the Employer.

M1206 INSPECTION OF POTHOLES, EDGE BREAKS AND SURFACE FAILURES FOR PAYMENT

(a) Non-performance based criteria

Inspection for the repair of potholes, edge breaks and surface failures will be done as and when required after the completion of the work by the Contractor.

If the Engineer instructs any work to be completed within a specified time, failure by the Contractor to comply within the completion time specified, shall render the Contractor liable for the penalty specified.

(b) Performance based criteria

Inspection for the repair of potholes, edge breaks and surface failures will be based on the following:

(i) Inspection of potholes, edge breaks and surface failures will be done monthly.
(ii) The road will be broken up into 10 km sections for inspection.
(iii) The total length of road shall be divided by 20 to determine the number of sections to be inspected. A maximum number of 4 sections and a minimum number of 2 sections shall be inspected and the positions will be chosen randomly. (The same sections of road will apply for sections M2400 and M2500).
(iv) If any section does not comply with any of the three acceptance criteria that section fails.

(v) The Contractor will be penalised by the number of failed sections multiplied by the penalty amount as specified in the Project Specifications.

M1207 MEASUREMENT AND PAYMENT

M1200 REPAIR OF POTHOLES

Item		Unit
M120.01	Pothole repair (non-performance based)	
(a)	Hot mix continuously graded asphalt	number (No)
(b)	Cold mix asphalt	number (No)

The unit of measurement shall be the number of potholes repaired according to the type of material used, 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.

Item		Unit
M120.02	Pothole repair (performance based)	month

The unit of measurement shall be month for the repair of potholes.

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.

Item		Unit
M120.03	Temporary pothole repair material for the route patrol	
(a)	Cold mix asphalt	kilogram (kg)

The unit of measurement shall be the kilogram of pothole material used.

The tendered rate shall include full compensation for the procurement and storage of the pothole repair material used by the route patrol.

M1210 REPAIR OF EDGE BREAKS

Item		Unit
M121.01	Repair of edge breaks (non-performance based)	
(a)	Hot mix continuously graded asphalt	metre (m)
(b)	Cold mix asphalt	metre (m)

The unit of measurement for repairing edge breaks shall be the metre of edge breaks repaired according to the type of material used, 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.

Item		Unit
M121.02	Repair of edge breaks (performance based)	month

The unit of measurement shall be month for the repair of edge breaks.

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

Item		Unit
M122.01	Repair of surface failures (non-performance based)	
(a)	Hot mix continuously graded asphalt	number (No)
(b)	Cold mix asphalt	number (No)

The unit of measurement shall be the number of surface failures repaired according to the type of material used, 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.

Item		Unit
M122.02	Repair of surface failures (performance based)	month

The unit of measurement shall be month for the repair of surface failures.

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.

SERIES M1000: PAVEMENT MAINTENANCE

SECTION M1300: CRACK SEALING

CONTENTS

M1301 SCOPE

This section deals with all work in connection with the sealing of cracks in the road surface.

M1302 CLASSIFICATION OF CRACKS

Standard crack sealing refers to the sealing of singular line cracks, such as longitudinal cracks, transvers cracks and large block cracks, using cold or hot modified binders.

Cracks are 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.

The Engineer shall instruct the contractor regarding the type of treatment to be used in the various cases.

(a) Active cracks

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

b) Passive cracks

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

M1303 DESCRIPTION OF CRACKS AND REPAIR METHODS

(a) Active cracks

(i) Stabilisation cracks

- Description

Stabilisation or reflective (“Block”) cracking is active cracking with a very distinctive block form which with time deteriorates to secondary cracking

at closer spacing and eventually if untreated forms large open closely spaced cracks. These cracks are associated with cemented pavement layers.

- Repair method

Blow out all loose material and grit from the cracks. Prime cracks with an inverted bitumen emulsion primer as specified. Fill the cracks with modified binder crack sealants as listed in the project specification of pricing schedule 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.

(ii) Volcano cracks

- 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 10 mm wide with a raised edge like rim of a volcano.

- Repair method

The crack shall be prepared by blowing out all loose material under pressure. The surface for a width of 300 mm on either side of the crack should be treated with a rejuvenator (softening agent).. The crack should be primed with an inverted bitumen emulsion prime as specified, and filled with a modified binder crack sealants as listed in the project specification of pricing schedule. The raised areas around the crack shall be compacted with a vibratory roller (min 1,5 ton) until the area is level with the surrounding surface.

(iii) Expansive soil cracks and longitudinal cracks

- 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.

- 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 bitumen emulsion prime as specified, then fill the crack with a modified binder crack sealants as specified in the project specification or pricing schedule. Allow the emulsion to break and then apply a geotextile bandage or a prefabricated road 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 100 mm of fill material for a spade width about the crack with 2% bentonite and water and compact lightly to the shape of the slope.

(b) Passive cracks

(i) Surfacing cracks (map cracks)

- 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.

- Repair method

Blow out the cracks to remove all loose material. Apply inverted bitumen emulsion prime (MSP1) 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.

(ii) Crocodile cracks

- 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.

- Repair method

Limited areas of crocodile cracking can be treated as a holding measure by applying a geotextile or a prefabricated road patch. The bandage should be protected/armoured by treating it with a further application of bitumen emulsion (as specified) and a nominal 7 mm washed aggregate (the use of crusher sand is not recommended) as per the supplier's specification.

(iii) Long cracks

- Description

Long cracks are fairly straight single cracks which often occur along construction joints in the surfacing or base. They are also quite common

where the surfacing meets concrete channels and kerbs. The cracks are generally open but not wide (say less than 5 mm). However, they tend to catch and hold water. Other random single passive cracks can be grouped under this description.

- Repair method

  Narrow cracks (< 3 mm)

  Blow out all loose material and grit from the cracks. Prime cracks with an inverted bitumen emulsion prime as specified. Fill the cracks with a modified binder crack sealants as specified in the project specification or pricing schedule.. 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 (> 3 mm)

  Cracks may be filled with fine dry sand. More than one filling may be necessary to fill the crack. Prime the crack with an inverted bitumen emulsion prime (MSP1), then Fill the cracks with a modified binder crack sealants as specified in the project specification or pricing schedule, then apply a geotextile or a prefabricated road patch. Where cracks occur in the fill slope fill the crack with bentonite (2%) and sand slurry to prevent ingress of water.

M1304 EXECUTION OF WORK

(a) Cleaning of standard cracks

The cracks shall be blown out with heated ("hot air 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.

A supply of approved herbicide diluted in accordance with the requirement of the project specifications shall be prepared. The solution shall be sprayed into cracks on the surfaced shoulders of the road or on such extended area as specified in the project specifications by means of rucksack type of sprayers and allowed to dry.

(b) Priming of standard cracks

No line cracks smaller than 3mm width shall be sealed unless so ordered by the Engineer.
Cracks 3mm and wider 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) Sealing of cracks

(i) Standard crack sealing

As specified above in M1303.

(ii) Geotextile crack sealing

Cracks such as “crocodile” cracks, designated by the engineer to be sealed using a geotextile-based crack sealing method shall be treated as follows:

The cracks and surrounding surface shall be cleaned using compressed air and sweeping the area with hand brooms. The exact area where the geotextile should be applied shall be marked out. A tack coat of bitumen emulsion (usually 65% cationic bitumen emulsion) as specified shall be applied at a spray rate of 0.8l/m² by means of a hand applicator. The geotextile shall then be applied to the wet tack coat by hand and rolled with a suitable roller to ensure satisfactory bonding between the geotextile and the road surface. All wrinkles in the geotextile shall be smoothed out. The geotextile is then saturated by applying a final coat of bitumen emulsion (usually 65% cationic bitumen emulsion) as specified by hand at 1.2l/m² which is spread out with a squeegee. The second application of the emulsion may be diluted with water to aid the saturation of the geotextile, if required or ordered by the Engineer. A layer of washed sand as specified, not more than 5mm thick, with a nominal stone size of 5mm shall then be applied using shovels and appropriate spreading tools.

(d) 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.

Where geotextile patches have been constructed they shall not be opened to traffic until the emulsion has cured completely.

(e) 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 3 days 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.

(f) General

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

M1305 MATERIAL

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

(a) Bituminous Binders

(i) Modified binder for standard crack sealing

The classification of modified binders for crack sealing, minimum required properties and requirements for short term handing and application, shall be in accordance with the latest publication of TG1.

The binders to be used for the sealing of cracks shall be C-E1, CC-E1 or C-R1 modified binder crack sealants as listed in the Pricing Schedule.

The particular values within the limits of the specifications given in TG1 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 shall be reported to the Engineer

The classification of modified binders for crack sealing shall be as shown in Table 1305/1

TABLE 1305/1: CLASSIFICATION OF MODIFIED BINDERS FOR CRACK SEALING	
Modified Binder Class (C)	Application
C-E1	Crack Sealant – Hot applied
CC-E1	Crack Sealant – Cold applied
C-R1	Crack Sealant – Hot applied

The letter codes used in the classification are defined as follows:
C – crack seal applications (hot applied)
CC – crack seal applications (cold applied)
E – a polymer of the elastomer type (e.g. SBR, SBS, etc)
R – crumbed rubber

Cracks wider than 3 mm are to be sealed with C-E 1 binder and cracks < 3 mm with CC – E1 binder.

(ii) Bituminous binder for geotextile crack sealing.

The bituminous binder for geotextile crack sealing shall be one of the following as specified Project Specifications/Pricing Schedule. The classification of modified binders for crack sealing shall be as shown in Table 1305/2

TABLE 1305/2: BITUMINOUS BINDERS FOR GEOTEXTILE CRACK SEALING	
Bituminous binder	Specification
Anionic bitumen emulsion	SANS 4001 – BT3
Cationic bitumen emulsion (solvents omitted)	SANS 4001 – BT4
SC-E1(solvents omitted)	TG1
Other appropriate product	Certified by independent certification agency

(b) Prime

The prime used for standard crack sealing shall be an inverted bitumen emulsion complying with SANS 4001 – BT5, such as MSP1 or equivalent. . Tar based primes shall not be used.

(c) Aggregate

(i) Aggregate for blinding for standard crack sealing

Where so instructed, blinding material shall consist of crushed rock or river sand, with 100% passing the 7mm sieve and not more than 10% passing the 2mm sieve. The aggregate shall be clean, hard and free from excessive dust and shall contain no clay, loam or other deleterious matter.

Sieve size	Particle Size Distribution (% passing by mass)
7.1	100
5	85 -100
3.35	0 - 30
2	0 - 5
0.75	0-1

(ii) Aggregate for armouring geotextile fabric

A layer of washed sand as specified in the table below, not more than 5mm thick, with a nominal stone size of 5mm shall then be applied using shovels and the area should be opened to traffic."

Sieve size (mm)	**Percentage passing by mass**
7	100
0,300	0 – 15
0,150	0 - 2

(d) Geotextile fabric

The geotextile shall be a non-woven geofabric, double punched with unit mass of 140g/m^2 with properties as specified in SANS 10318.

M1306 EQUIPMENT

(a) Blowing out of cracks

The Contractor must provide a mobile compressor capable of discharging 3 m^3/min compressed air at 650 kPa pressure. The compressed air shall be free of water, oil and 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 300ºC in the combustion chamber.

(b) Prime injectors for standard cracks

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 20 mm 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 applicator

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. Only pumps, which can deliver the sealant to the crack in a controlled fashion, shall be used.

The sealant shall only be applied with pressure type application 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 resultant poor workmanship.

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

(d) Equipment for applying geotextiles

The contractor shall provide the following equipment:

- Suitable hand applicator for emulsion application
- Pneumatic-tyred roller (“bakkie” may be used for small repairs)
- Other hand equipment suitable for the intended use and working areas to obtain the specified final product.

The geotextile shall be applied according to the manufacturer’s 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 2 mm 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

Where required, a vibratory steel-wheeled roller of 1,5tons mass with an adjustable amplitude and frequency of vibration shall be utilised to flatten out any ridges.

M1307 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 3 mm.

The contractor shall ensure that the sealant mixture actually penetrates the crack and does not merely cover the crack in the form of a bandage. All excess sealant on the road surface wider than 30mm on each side of the crack shall be removed and shall not be paid for.

M1308 MEASUREMENT AND PAYMENT

M1300 SEALING CRACKS

Item			Unit
M130.01	Cleaning and sealing the cracks		
(a)	Cleaning cracks per metre with:		
	(i)	Cold compressed air	metre (m)
	(ii)	Hot compressed air	metre (m)
(b)	Cleaning cracks per area with:		
	(i)	Cold compressed air	square metre (m^2)
	(ii)	Hot compressed air	square metre (m^2)
(c)	Applying herbicides for sealing cracks		litre (ℓ)
(d)	Priming of cracks		metre (m)
(e)	Sealing the cracks with:		
	(i)	C-E1 modified binder	metre (m)
	(ii)	CC-E1 modified binder	metre (m)
	(ii)	C-R1 modified binder	metre (m)
(f)	Extra over item M130.01(e) for filling wide cracks with fine sand to underside of base layer as specified.		metre (m)
(g)	Heating of surface before rolling		metre (m)
(h)	Rolling the cracks		metre (m)

The tendered rates shall include full compensation for treating the crack as specified.
The unit of measurement for subitem M130.01 (a) (i) and (ii), the complete process of blowing out cracks, shall be the metre of crack blown out as specified.

The unit of measurement for subitem M130.01 (b) (i) and (ii), the blowing out of the cracks over an area where subitem M130.01 (a) 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 subitem M130.01 (c), applying herbicide for sealing the cracks, shall be the litre of herbicide applied to the crack prior to sealing.

The tendered rate shall include full compensation for furnishing and procuring the product, materials and equipment, for labour, applying the product, re-applications where necessary, and all other incidentals necessary for treating the crack as specified.

The unit of measurement for subitem M130.01 (d), supplying and jetting the bitumen emulsion prime, shall be the metre of crack primed.

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

The unit of measurement for subitem M130.01 (e), sealing the crack, shall be the metre of crack sealed. Payment shall distinguish between the modified binders as specified in M130.01(e)(i)(ii) or (iii).

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 and finishing, and all other incidentals necessary for sealing the crack as specified.

The unit of measurement for subitem M130.01 (f), shall be the metre of crack filled with fine sand to bottom of base pavement layer.

The tendered rate shall include full compensation for furnishing and procuring the materials and equipment, for labour, applying the fine sand, and all other incidentals necessary for filling the crack as specified.

The unit of measurement for subitem M130.01 (g), where the road surface requires heating prior to rolling, the unit of measurement shall be a metre of crack heated to the satisfaction of the engineer.

The unit of measurement for subitem M130.01 (h), where the road surface requires heating prior to rolling, the unit of measurement shall be a metre of crack heated to the satisfaction of the engineer.

The unit of measurement for subitem M130.01 (h), where cracks must be rolled, the unit of measurement shall be a metre of crack rolled to the satisfaction of the engineer.

The tendered rates for M130.01(g) and (h) 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 and finishing, and all other incidentals necessary to complete the works.

Item			Unit
M130.02	Geotextile crack sealing		
(a)	Sealing cracks with 200mm wide geotextile “bandage” using:		
	(i)	65% Cationic bitumen emulsion (solvents omitted)	metre (m)
	(ii)	SC-E1 modified emulsion (solvents omitted)	metre (m)
	(iii)	Other appropriate product	metre (m)
(b)	Sealing “crocodile” cracks with geotextile over areas using:		
	(i)	65% Cationic bitumen emulsion (solvents omitted)	square metre (m^2)
	(ii)	SC-E1 modified emulsion (solvents omitted)	square metre (m^2)

The unit of measurement for subitem M130.02 (a), shall be the metre of 200mm wide geotextile "bandage" applied as specified.

The unit of measurement for subitem M130.02 (b), of geotextile crack sealing shall be the square metre crack sealed with the geotextile as specified.

The tendered rate shall include full compensation for procuring and supplying all materials, labour, transport and other incidentals required to complete the work in accordance with the specifications

Item			Unit
M130.03	Pre-fabricated road patch for crack sealing		
(a)	Sealing "crocodile" cracks with pre-fabricated road patch over areas, using:		
	(i)	10mm nominal size aggregate (single seal)	square metre (m^2)
	(ii)	14mm nominal size aggregate (single seal)	square metre (m^2)

The unit of measurement for subitem M130.03 (a), of pre-fabricated road patch crack sealing shall be the square metre crack sealed as specified.

The tendered rate shall include full compensation for procuring and supplying all materials, labour, transport and other incidentals required to complete the work in accordance with the specifications

SERIES M1000: PAVEMENT MAINTENANCE

SECTION M1400: BLEEDING REPAIR

CONTENTS

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 swept 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.

(iii) Method 3

If the binder of the existing surface has an oxidised film or if the road has been used by traffic for some time, the surface shall be softened by heating apparatus. The heating apparatus shall be an approved type that does not expose the road surface to open flames. This work shall only commence when the road temperature exceeds 30°C.

The aggregate, heated to 60°C at the time of application shall be applied to the surface at the rate determined by the Engineer and immediately rolled with a flat wheeled (steel) roller as well as a pneumatic-tyred roller, until the aggregate is firmly embedded. All loose aggregate not embedded shall be broomed off the road before it is opened to traffic. The road shall only be opened to traffic if the road surface temperature has cooled off sufficiently in the opinion of the Engineer, usually in the late afternoon. When opening the road to traffic the treated areas shall be demarcated with traffic cones and speed limit and “loose stone” signs for at least the first two days. All loose aggregate shall be broomed off and removed at least twice per day until full adhesion of the aggregate has been achieved.
Areas where whip-off is excessive after the treatment has been completed, shall be retreated in accordance with the Engineer’s instructions.

(iv) Method 4

Areas with excess binder, Degree 3 or more according to TMH9 Part B and/or insufficient macro texture, the Engineer may instruct that the excess binder be removed by way of using water cutting. The Engineer shall be marked out to be treated.

Trials shall be conducted with the approved apparatus using different pressure settings and jets to obtain the target macro texture for the particular type of seal. Before opening any rectified work to traffic, the road surface shall be properly cleaned and the waste material spoiled at an approved dump site.

This work is to be undertaken by a specialist sub-contractor.

(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^2)**	**Tack coat (litre per m^2) Conventional bitumen and emulsion. (Residual cold bitumen)**	**Aggregate (m^2/m^3)**
14,0	0,1	1,4	100
10,0	0,1	1,0	140
7,0	0,1	0,75	200
5,0	0,1	0,6	250

The fog spray shall be applied at a rate of 0,8 litre per $m^{2.}$

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

(d) Precoating fluid application rates

The following nominal application rates shall apply:

TABLE M1402/2 : PRECOATING APPLICATION		
Nominal aggregate size (mm)	**Nominal precoating application on stockpile or by hand rate (l/m^3)**	**Nominal precoating application plant precoating rate (l/m^3)**
14,0	14	12
10,0	16	14
7,0	18	16
5,0 or grit	20	18

M1403 MATERIAL

(a) Aggregates

The aggregates for bleeding correction shall comply with the requirements of Table M1403/1 and Table M1403/2. The engineer will determine the size of the aggregate to be applied to the designated areas. The minimum ALD of 5,9mm for the 10mm aggregate and 4,2mm for the 7mm aggregate shall apply.

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

TABLE M1403/1: CRUSHED AGGREGATE					
Sieve size (mm)		**Percentage by mass passing**			
		14,0 mm nominal size	**10,0 mm nominal size**	**7,0 mm nominal size**	**5,0 mm nominal size**
37,50	Grades 1 & 2	–			–
28,00		–			–
20,00		100			–
14,00		85 - 100	100		–
10,0		0 - 30	85 - 100	100	–
7,0		0 - 5	0 - 30	85 - 100	100
5,0			0 - 5	0 - 30	85 – 100
3,35					0 – 30
2,00				0 - 5	0 – 5
	Grade 1	0,5	0,5	0,5	1,0

Fines content: Material passing a 0,425 mm sieve (max)	Grade 2	1,5	1,5	1,5	2,5
Dust content: Material passing a 0,075 mm sieve (max)	Grade 1	0,2	0,2	0,5	0,5
	Grade 2	0,5	0,5	1,0	1,0

TABLE M1403/2: SAND

Sieve size (mm)	Percentage by mass passing through sieve
7,0	100
0,300	0 – 15
0,150	0 – 2
Sand Equivalent [%] (min)	35
Plasticity Index: Non-Plastic	

(b) Bituminous binders

Bituminous binders shall comply with the following specifications:

- Penetration-grade bitumen complying with SANS 4001-BT1
- Cut-back bitumen complying with SANS 4001 – BT2
- Anionic bitumen emulsion complying with SANS 4001 – BT3
- Cationic bitumen emulsion complying with SANS 4001 – BT4

(c) Precoating fluid

Precoating fluid shall be manufactured from petroleum-based products. The use of tar based precoating fluids shall not be permitted.

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.

If required, an adhesion agent approved by the engineer shall be added to the precoating fluid at a rate of 0.5% of the volume of precoating fluid.

M1404 ACCEPTANCE CRITERIA

The bleeding repair 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 swept 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

Item		Unit
M140.01	Repair of bleeding (Method 1)	
(a)	Using 14,0 mm aggregate	square metre (m^2)
(b)	Using 10,0 mm aggregate	square metre (m^2)
(c)	Using 7,0 mm aggregate	square metre (m^2)
(d)	Using 5,0 mm aggregate	square metre (m^2)

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

Item		Unit
M140.02	Repair of bleeding (Method 2)	
(a)	Using 14,0 mm aggregate	square metre (m^2)
(b)	Using 10,0 mm aggregate	square metre (m^2)
(c)	Using 7,0 mm aggregate	square metre (m^2)
(d)	Using 5,0 mm aggregate	square metre (m^2)

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

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

Item		Unit
M140.03	Repair of bleeding (Method 3)	
(a)	Using 14,0 mm aggregate	square metre (m^2)
(b)	Using 10,0 mm aggregate	square metre (m^2)
(c)	Using 7,0 mm aggregate	square metre (m^2)
(d)	Using 5,0 mm aggregate	square metre (m^2)

The unit of measurement shall be square metre of bleeding area repaired as specified for Method 3.

The tendered rate shall include full compensation for furnishing all materials, providing the heating apparatus and heating the road surface, heating the aggregate, spreading of aggregate and rolling, and all other incidentals necessary for completing the work as specified for Method 3.

Item		Unit
M140.04	Precoating of aggregate	cubic metre (m^3)

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

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

Item		Unit
M140.05	Aggregate variations	
(a)	14,0 mm aggregate	cubic metre (m^3)
(b)	10,0 mm aggregate	cubic metre (m^3)
(c)	7,0 mm aggregate	cubic metre (m^3)
(d)	5,0 mm aggregate	cubic metre (m^3)

The unit of measurement shall be cubic metre of increased or decreased aggregate applied as compared to the quantities required at nominal application rates.

Item		Unit
M140.06	Bituminous binder variations (specify type)	
(a)	Precoating fluid	litre (ℓ)
(b)	Anionic bitumen emulsion	litre (ℓ)
(c)	Cationic bitumen emulsion	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 M0226MDS.

Item		Unit
M140.07	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 rate shall include full compensation for furnishing the material and applying the fog spray as specified.

Item		Unit
M140.08	Aggregate for blinding	
(a)	Natural sand	cubic metre (m^3)
(b)	Crusher sand	cubic metre (m^3)

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

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

Item			Unit
M140.09	Bleeding repair by water cutting		
	(a)	Bleeding repair by water cutting	Provisional sum (Prov Sum)
	(b)	The Contractor's overhead charges and profit in respect of sub-item M140.09(a)	Percentage (%)

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for sub-item M140.09 (b) is a percentage of the amount actually spent under sub-item M140.09 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M1000: PAVEMENT MAINTENANCE

SECTION M1500: CRACK AND JOINT SEALING OF CONCRETE PAVEMENTS

CONTENTS

M1501 SCOPE

This section covers the sealing or resealing of existing joints and random cracks in concrete pavements. It also covers temporary partial-depth concrete pothole repairs and the permanent repair of concrete pavements with hand equipment.

The work shall be undertaken by specialist subcontractors with relevant experience.

M1502 EXECUTION OF WORK

Resealing of joints, sealing of cracks, temporary partial-depth concrete pothole repairs and the permanent repair of 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 hand brooms 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 30 m.

(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 12 mm wide by 18 mm 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 sealant (see requirements in M1503(a)) 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 3 mm and 5 mm below the paved surface.

(a) Temporary partial-depth concrete pothole repair

(i) Excavation

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.

(i) Backfilling

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^2. 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.

(b) Permanent repair of concrete pavements

(i) Excavation

The concrete pavement shall be saw cut to the specified depth below the road surface and shall have a neat rectangular shape, parallel and at right angles to the direction of traffic. The existing material shall be removed in a neat rectangle to sound base, with a minimum dimension of 200 mm x 200 mm.

(i) Placing and spreading the concrete

The concrete shall be placed and spread uniformly to a surcharge of about one-fifth more than the final pavement thickness and shall be compacted, struck off and finished to the level of the adjacent pavement.

(ii) Compacting and finishing

The concrete shall be compacted by means of vibrating finishing beams. In addition, internal poker vibrators shall be used for slabs thicker than 150 mm. Where used, the pokers shall be inserted at points not more than 500 mm apart over the whole area of the slab, and adjacent to the edge of a previously constructed slab. The surface shall be regulated and finished to the level of adjacent slabs by using twin vibrating beams. The beams shall be of metal with a contact surface at least 50 mm wide and a vibrating unit having a minimum centrifugal force of 4 kN with a frequency recommended by the manufacturer or an equivalent compactive effort. The vibrating beams shall be moved forward at a steady speed of 0,5 m to 1,0 m per minute whilst vibrating over the compacted surface, to produce a smooth finish.

The surface shall then be further smoothed by at least two passes of a scraping straight-edge with a blade length of not less than 2,4 m. The final surface finish of the concrete shall be effected by means of hand-operated floats.

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 23ºC ± 2ºC	0,31 MPa max
Extrusion rate, tested with a pneumatic caulking gun with a 3,18 mm nozzle at a pressure of 0,62 MPa Material temperature – 18ºC Material temperature – 38ºC	 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 being 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 -18ºC
Colour	Grey

(e) Asphalt surfacing

Asphalt surfacing as specified in M1100: Pavement Layer Repairs is to be used for temporary partial-depth concrete pothole repair.

(f) Concrete

The specified compressive strength of the concrete used shall be 35 MPa at 28 days and shall be a mixture of approved cement, water, aggregates (coarse and fine) and admixtures to the concrete as specified in the project specification.

The preliminary proportions of cement and aggregate required for producing concrete which complies with the requirements of the project specification, shall be determined by way of laboratory tests on concrete manufactured from the cement, coarse and fine aggregates, admixtures (if any) and water proposed for use in the works. The water: cement ratio shall not exceed 0,53.

M1504 ACCEPTANCE CRITERIA

The sealing, temporary partial-depth concrete pothole repairs and permanent repair of concrete pavements shall be executed and finished strictly in accordance with the prescribed requirements.

M1505 MEASUREMENT AND PAYMENT

M1500 REPAIR OF CONCRETE PAVEMENTS

Item			Unit
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) Less than 12mm width	metre (m)
		(ii) 12mm to 20mm width	metre (m)
		(iii) Exceeding 20mm width	metre (m)
	(c)	Cracks:	
		(i) Less than 12mm width	metre (m)
		(ii) 12mm to 20mm width	metre (m)
		(iii) Exceeding 20mm width	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.

Item		Unit
M150.02	Temporary partial-depth pothole repair of concrete with asphalt surfacing	
(a)	Hot mix continuously graded asphalt	number (No)
(b)	Cold mix asphalt	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.

Item		Unit
M150.03	Small repairs to existing concrete pavements	
	(a) Small repairs to existing concrete pavements	Provisional sum (prov sum)

(b) The Contractor's overhead and charges and profit in respect of sub-item M150.03(a) 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 for the Contractor, and the profit in connection with providing the service.

SERIES M1000: PAVEMENT MAINTENANCE

SECTION M1600: SURFACE TREATMENT – TEXTURE CORRECTION

CONTENTS

M1601 SCOPE

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

M1602 MATERIAL

(a) Aggregate for slurry

Aggregate for texture slurry shall comply with the specifications for fine slurry, fine grade or medium grade

The aggregate for slurry seals shall be an approved crusher sand obtained from a parent rock having a 10% FACT value (dry) of at least 150 or a mixture of such crusher sand and an approved clean natural sand, where the mixture does not contain more than 25% of natural sand. The engineer may order the addition of an approved natural sand or additional cement to improve either the permeability or workability of the slurry. The aggregate shall be clean, tough, durable, and angular in shape and shall comply with the following grading requirements:

TABLE M1602/1: GRADING LIMITS OF AGGREGATE FOR SLURRY

Sieve size (mm)	Percentage passing sieve by mass				
	Fine slurry			Coarse slurry	
	Fine grade	Medium grade	Coarse grade	Type 1	Type 2
14					100
10				100	86 – 100
7		100	100	87 – 100	71 – 91
5	100	84 – 100	72 – 91	72 – 91	62 – 82
2	84 – 99	51 - 90	40 – 64	40 - 63	36 – 56
1	60 - 90	33 – 68	25 - 46	22 – 41	22 - 41
0,600	42 – 72	22 – 50	19 – 34	15 – 30	15 – 30
0,300	23 – 48	15 – 37	12 – 25	10 – 20	10 – 20
0,150	10 – 27	7 – 20	7 – 18	6 – 15	6 – 15
0,075	4 - 12	4 - 12	2 - 8	4 - 10	4 - 10

The sand equivalent determined in accordance with SANS 3001 - AG5, shall be at least 35.

To ensure proper adhesion, the immersion index of briquettes made with slurry aggregate and 70/100 penetration-grade bitumen at the specified net bitumen content for the slurry shall be not less than 75.

(b) Cement filler for slurry

CEM II-32,5 cement (shall comply with the requirements of SANS 50197.

(c) Bitumen emulsions

Anionic and cationic and stable-grade bitumen emulsion shall comply with the provisions of SANS 4001 – BT3 and SANS 4001 – BT4 respectively.

Unless otherwise specified in the project specifications or schedule of quantities, the bituminous binder shall be a 60% stable-grade anionic bitumen emulsion.

(d) Slurry

Nominal rates for tender purposes shall be as indicated in table :

TABLE 1602/2: NOMINAL RATES OF APPLICATION FOR TEXTURE TREATMENT AND RUT CORRECTION	
Component	**Nominal rate**
Bond coat	0.5 l/m^2
Texture slurry application	0,003m^3/m^2
Emulsion content for the texture slurry	200 l/m^3
Emulsion content for the coarse slurry (rut filling)	210 l/m^3
Active filler content of the slurry and micro surfacing	1.65 kg/m^3

The volume of water in the slurry mix, shall be such that the slurry consistency when measured in accordance with ASTM D3910 Section 6.1 shall be between 30mm and 40mm

M1603 EXECUTION OF THE WORKS

(a) Preparation (General)

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 treated with a slurry shall be clearly demarcated.

(b) Mixing slurry (General)

A mixer of a type approved by the engineer shall be provided in a good working order capable of producing a uniform slurry of the constituent materials. All the constituents of the slurry shall be accurately proportioned and due care and attention shall be given to the sequence in which the ingredients are introduced into the mixer and to the period of mixing. Mixing shall be continued until the materials in each batch are thoroughly blended.

(c) Execution – 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% bitumen emulsion shall be sprayed onto the surface at an application rate of 0,5 litre per m^2, or as instructed by the Engineer.

Slurry for texture treatment slurry shall comply with the specifications for fine slurry, fine grade or medium grade (as specified in the Project Specifications or pricing schedule) and 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. The squeegee squad shall be allowed to complete the spreading of each batch discharged onto the road, using squeegees, before the next batch is discharged.

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 instructed by the Engineer. In such a case, the nominal application rate for tender purposes is 0,004 m^3/m^2.

(d) Execution – Rut filling

Before the surface is treated with a slurry, a tack coat of 30% bitumen emulsion shall be sprayed onto the surface at an application rate of 0,5 litre per m^2, or as instructed by the Engineer.

Medium or coarse grade slurry as specified in the Project Specifications shall be applied to fill ruts up to a maximum of 15 mm 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 tons.

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.

(c) Finishing (General)

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.

M1604 MEASUREMENT AND PAYMENT

M1600 SURFACE TREATMENT – TEXTURE CORRECTION

Item		Unit
M160.01	Application of slurry mixed on site	
(a)	Tack coat using 30% stable grade bitumen emulsion	litre (ℓ)
(b)	Slurry applied for texture treatment (specify grading and type of binder)	
	(i) Applied by hand	cubic metre (m^3)
	(ii) Applied by spreader box	cubic metre (m^3)

(c)	Slurry applied for texture treatment (specify grading and type of binder)		
	(i)	Applied by hand	cubic metre (m^3)
	(ii)	Applied by spreader box	cubic metre (m^3)
(d)	Slurry applied for texture treatment (specify grading and type of binder)		
	(i)	Applied by hand	cubic metre (m^3)
	(ii)	Applied by spreader box	cubic metre (m^3)
(e)	Slurry applied for texture treatment (specify grading and type of binder)		
	(i)	Applied by hand	cubic metre (m^3)
	(ii)	Applied by spreader box	cubic metre (m^3)

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.

Item			Unit
M160.02	Application of slurry from commercial sources		
(a)	Tack coat using 30% stable grade bitumen emulsion		litre (ℓ)
(b)	Slurry applied for texture treatment (specify grading and type of binder)		
	(i)	Applied by hand	cubic metre (m^3)
	(ii)	Applied by spreader box	cubic metre (m^3)
(c)	Slurry applied for texture treatment (specify grading and type of binder)		
	(i)	Applied by hand	cubic metre (m^3)
	(ii)	Applied by spreader box	cubic metre (m^3)
(d)	Slurry applied for texture treatment (specify grading and type of binder)		
	(i)	Applied by hand	cubic metre (m^3)
	(ii)	Applied by spreader box	cubic metre (m^3)
(e)	Slurry applied for texture treatment (specify grading and type of binder)		

(i)	Applied by hand	cubic metre (m^3)
(ii)	Applied by spreader box	cubic metre (m^3)

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

Item		Unit
M161.01	Application of slurry for rut filling mixed on site	
(a)	Tack coat using 30% stable grade bitumen emulsion	litre (ℓ)
(b)	Slurry applied by spreader box with rigid squeegees in one application for rut filling (Fine Slurry Medium Grade, Modified Cationic Bitumen Emulsion AC-E1)	cubic metre (m^3)
(c)	Slurry applied by spreader box with rigid squeegees in two applications for rut filling (Fine Slurry Medium Grade, Modified Cationic Bitumen Emulsion AC-E1)	cubic metre (m^3)
(d)	Slurry applied by spreader box with rigid squeegees in one application for rut filling (Fine Slurry Coarse Grade, Modified Cationic Bitumen Emulsion AC-E1)	cubic metre (m^3)
(e)	Slurry applied by spreader box with rigid squeegees in two applications for rut filling (Fine Slurry Coarse Grade, Modified Cationic Bitumen Emulsion AC-E1)	cubic metre (m^3)
(f)	Slurry applied by spreader box with rigid squeegees in one application for rut filling (Fine Slurry Medium Grade, Modified Cationic Bitumen Emulsion AC-E2)	cubic metre (m^3)
(g)	Slurry applied by spreader box with rigid squeegees in two applications for rut filling (Fine Slurry Medium Grade, Modified Cationic Bitumen Emulsion AC-E2)	cubic metre (m^3)
(h)	Slurry applied by spreader box with rigid squeegees in one application for rut filling (Fine Slurry Coarse Grade, Modified Cationic Bitumen Emulsion AC-E2)	cubic metre (m^3)
(i)	Slurry applied by spreader box with rigid squeegees in two applications for rut filling (Fine Slurry Coarse Grade, Modified Cationic Bitumen Emulsion AC-E2)	cubic metre (m^3)

The unit of measurement for tack coat shall be the litre of emulsion measured at spraying temperature, and for slurry applied by 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.

Item		Unit
M161.02	Application of slurry for rut filling from commercial sources	
(a)	Tack coat using 30% stable grade bitumen emulsion	litre (ℓ)
(b)	Slurry applied by spreader box with rigid squeegees in one application for rut filling (Fine Slurry Medium Grade, Modified Cationic Bitumen Emulsion AC-E1)	cubic metre (m^3)
(c)	Slurry applied by spreader box with rigid squeegees in two applications for rut filling (Fine Slurry Medium Grade, Modified Cationic Bitumen Emulsion AC-E1)	cubic metre (m^3)
(d)	Slurry applied by spreader box with rigid squeegees in one application for rut filling (Fine Slurry Coarse Grade, Modified Cationic Bitumen Emulsion AC-E1)	cubic metre (m^3)
(e)	Slurry applied by spreader box with rigid squeegees in two applications for rut filling (Fine Slurry Coarse Grade, Modified Cationic Bitumen Emulsion AC-E1)	cubic metre (m^3)
(f)	Slurry applied by spreader box with rigid squeegees in one application for rut filling (Fine Slurry Medium Grade, Modified Cationic Bitumen Emulsion AC-E2)	cubic metre (m^3)
(g)	Slurry applied by spreader box with rigid squeegees in two applications for rut filling (Fine Slurry Medium Grade, Modified Cationic Bitumen Emulsion AC-E2)	cubic metre (m^3)
(h)	Slurry applied by spreader box with rigid squeegees in one application for rut filling (Fine Slurry Coarse Grade, Modified Cationic Bitumen Emulsion AC-E2)	cubic metre (m^3)
(i)	Slurry applied by spreader box with rigid squeegees in two applications for rut filling (Fine Slurry Coarse Grade, Modified Cationic Bitumen Emulsion AC-E2)	cubic metre (m^3)

The unit of measurement for tack coat shall be the litre of emulsion measured at spraying temperature, and for slurry applied by 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.

Item		Unit
M161.03	Application of slurry for rut filling from commercial sources	
(a)	Application of slurry for rut filling from commercial sources	Provisional Sum (Prov. Sum)
(b)	The Contractor's overhead charges and profit in respect of sub-item M161.03(a)	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 for the Contractor, and the profit in connection with providing the service.

SERIES M1000: PAVEMENT MAINTENANCE

SECTION M1700: REPAIR OF SLOPE FAILURES AND WASHAWAYS

CONTENTS

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 reuse, or transported to spoil if so instructed 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 150 mm after compaction with heavy compaction plant or to 100 mm 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:

Surface	(40 mm above final base layer) Asphalt (continuously graded medium) compacted to 97% minus % voids in approved production mix of Theoretical Maximum Relative Density (TMRD)
Base	(150 mm layer) Emulsion-treated crushed stone (ETB) compacted to 100% of Mod AASHTO maximum dry density or Crushed stone (G1) compacted to 88% apparent relative density, as specified.
Subbase	(2x 150 mm layers) Cement stabilised natural gravel compacted to 95% of Mod AASHTO maximum dry density
Selected	(150 mm layer) Natural gravel compacted to 93% of Mod AASHTO maximum dry density
Fill	(150mm layers) Natural gravel fill layers, as required, compacted as previously described.

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

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 250 mm 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 3 mm. 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 ± 0,5% crossfall.

When tested with a 3 m 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 10 mm.

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

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. Subbase material shall be G6 quality or better prior to stabilisation.

(b) Crushed stone base material

Crushed stone base material shall be as specified in section M1100: Pavement Layer Repairs.

(c) Stabilised subbase material

Stabilised materials shall be as specified in section M1100: Pavement Layer Repairs

(d) Tack coat

Tack coat shall be as specified in section M1100: Pavement Layer Repairs.

(e) Asphalt surfacing layer

Asphalt shall be 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.

Item			Unit
M170.01	Reconstruction of slope failures and washaways - mass earthworks		
	(a) Excavation and removing excavated material to spoil or stockpile as directed by the Engineer. A distinction shall be made between:		
		(i) Soft material	cubic metre (m^3)
		(ii) Intermediate material	cubic metre (m^3)
		(iii) Hard and boulder class material	cubic metre (m^3)
	(b) Drying excavated material suitable for reuse		cubic metre (m^3)
	(c) Roadbed compaction to 90% of modified AASHTO density		cubic metre (m^3)
	(d) Backfill at excavated area in		
		(i) Fill embankments to 90% of modified AASHTO density	cubic metre (m^3)
		(ii) Cut embankments to 90% of modified AASHTO density	cubic metre (m^3)

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 authorized dimensions of the fill layer.
- Excavated material and material for drying will be measured in loose heaped dimensions after excavation.

The quality 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 completion of any preparatory roadbed treatment which may have been ordered by the Engineer, but prior to 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 the 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 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 1,0 km; for preparing, processing, shaping, watering, mixing and compacting the materials to the densities or in the manner specified herein and for the removing and disposing of up to 5% oversize material from the road after processing, including transport for free haul distance of 1,0km.

Item		Unit
M170.02	Reconstruction of pavement layers	
(a)	Natural gravel selected subgrade	cubic metre (m^3)
(b)	Cement stabilised natural gravel subbase	cubic metre (m^3)
(c)	Emulsion treated crushed stone base	cubic metre (m^3)
(d)	Crushed stone base (G1)	cubic metre (m^3)
(e)	Hot mix asphalt (Continuously graded medium)	cubic metre (m^3)
(f)	Cold mix asphalt (Agrèment SA certified)	cubic metre (m^3)

The unit of measurement for selected subgrade, cement stabilized natural gravel subbase, emulsion treated crushed stone base or unstabilised crushed stone base shall be the cubic metre of material measured in place after compaction. The unit of measurement for asphalt shall be the ton of asphalt placed according to the specifications. The quantity will be computed in accordance with the authorized dimensions of each layer. There will be no payment for wasted material.

The tendered rate shall include full compensation for all mixing, placing, trimming or cutting the edges of existing surfacing and pavement layers, compacting, including the floor, and finishing as

specified, work in restricted areas, and also for all machinery, equipment, labour, supervision and other incidentals for executing the work as specified.

The tendered rate for chemically stabilised gravel for subitems shall include full compensation for procuring the natural gravel (irrespective of its origin), providing the chemical stabilising agent, applying and mixing the stabilising agent and compaction to the required specifications and for all transport and other incidentals necessary for completing the work as specified.

The tendered rate for emulsion-treated crushed stone base shall include full compensation for providing the bituminous stabilising agent, applying and mixing the stabilising agent and compaction to the required specifications and for all transport and other incidentals necessary for completing the work as specified. The tendered rate shall include full compensation for procuring and supplying imported crushed stone for backfilling irrespective of its origin.

The tendered rate for asphalt shall include full compensation for procuring, furnishing and mixing all the materials, for placing the asphalt and for all transport and other incidentals necessary for completing the work as specified.

Item		Unit
M170.03	Prime and Tack coat	
(a)	30% stable grade emulsion	litre (ℓ)
(b)	Inverted bitumen emulsion prime	litre (ℓ)

The unit of measurement for the tack coat applied shall be the litre of emulsion measured at spraying temperature.

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

Item		Unit
M170.04	Overhaul on natural gravel material	Cubic metre kilometre (m^3.km)

The unit of measurement shall be the cubic metre of overhauled material, net 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.

Item			Unit
M170.05	Repair of slope failures and washaways		
	(a)	Repair of slope failures and washaways	Provisional sum (Prov sum)
	(b)	The Contractor's overhead charges and profit in respect of sub-item M170.05(a)	percentage (%)

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999.

The tendered percentage for sub-item M170.05 (b) is a percentage of the amount actually spent under sub-item M170.05 (a), which shall include full compensation for the overhead charges and profit of the Contractor

SERIES M2000: DRAINAGE MAINTENANCE

SECTION M2100: REPAIR AND MAINTENANCE OF INLET AND OUTLET STRUCTURES

CONTENTS

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 instructed 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 0.5 m 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 instructed 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 10 mm 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 instructed 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 instructed 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 an approved epoxy resin slurry. If dowels are required, they shall be installed in holes drilled into the existing structure according to details shown on the drawings or as instructed by the Engineer. Dowels shall be secured by means of an approved epoxy resin grout.

Where existing stone masonry headwalls and wingwalls 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 for in the Bill of Quantities.

(f) Backfilling to inlet and outlet structures

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

Generally the backfill material shall be sandy material, but may contain larger particles up to 38 mm 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 150 mm 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 50 mm. The full depth of a layer shall be tested.

(g) Maintenance of grids

In the case of steel grids the maintenance shall include the loosening of welded steel grid inlets or outlets and the reinstallation by means of welding of the grids to the original state. Where instructed by the Engineer grids may be welded shut to prevent the theft thereof.

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 on the drawings.

(b) Bricks

Bricks shall be engineering grade bricks conforming to the requirements of SANS 227.

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

(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 12 mm neither more than 20 mm 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 300 mm in diameter and shall not be smaller than 100 mm 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

Item		Unit
M210.01	Excavation	
(a)	Excavating soft material	cubic metre (m^3)
(b)	Excavating hard material	cubic metre (m^3)

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 0,5 m 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 1,0 km.

Item		Unit
M210.02	Backfilling	
(a)	Using the excavated material	cubic metre (m^3)
(b)	Using stabilised excavated material	cubic metre (m^3)

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 rate for stabilised backfill shall include full compensation for providing and mixing the stabilising agent with the natural material.

Item			Unit
M210.03	Reconstruction of inlet and outlet structures		
(a)	Concrete		
	(i)	15/19	cubic metre (m^3)
	(ii)	20/19	cubic metre (m^3)
	(iii)	25/19	cubic metre (m^3)

	(iv)	30/19	cubic metre (m^3)
(b)	Brickwork		cubic metre (m^3)
(c)	Plastering		square metre (m^2)
(d)	Maintenance of grids		
	(i)	Welding and loosening of steel grids	provisional sum (PS)
	(ii)	Overhead charges and profit in respect of subitem M210.03 (d)(i)	percentage (%)

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

The unit of measurement for plaster shall be the square metre of plasterwork provided.

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.

Measurement and payment for subitem M210.03 (d)(i) 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 subitem M210.03 (d)(i), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M210.04	Accessories	
(a)	Accessories	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M210.04 (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 subitem M210.04 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

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

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 1,0 km.

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.

Item			Unit
M210.06	Repairing of existing structures		
(a)	Concrete		
	(i)	15/19	cubic metre (m^3)
	(ii)	20/19	cubic metre (m^3)
	(iii)	25/19	cubic metre (m^3)
	(iv)	30/19	cubic metre (m^3)
(b)	Brickwork		cubic metre (m^3)
(c)	Stone masonry with rock material obtained from:		
	(i)	Natural sources	cubic metre (m^3)
	(ii)	Commercial sources	cubic metre (m^3)
(d)	Plastering		square metre (m^2)

The unit of measurement shall be the cubic metre of concrete, brickwork or stone masonry used in place for repairs, with distinction being made in the source for obtaining rock material.

The unit of measurement for plaster shall be the square metre of plasterwork provided.

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.

Item		Unit
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.

Item		Unit
M210.08	Overhaul on material hauled in excess of 1,0 km	
(a)	Excavated material to spoil	cubic metre kilometre (m^3.km)
(b)	Existing structures demolished	cubic metre kilometre (m^3.km)

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

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

SERIES M2000: DRAINAGE MAINTENANCE

SECTION M2200: SUBSOIL DRAIN INSTALLATION AND MAINTENANCE

CONTENTS

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 instructed 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 instructed 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 instructed 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 100 mm and compacted to at least the same density as the surrounding material.

(ii) With polyethylene lining to trenches

Where instructed 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 instructed 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 200 mm.

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 100 mm 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 instructed 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 Layers Repair. 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 shall be 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

(a) Pipes

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

Pipes shall comply with the following requirements:

Perforated or slotted unplasticized PVC with SANS 791;

Perforated high-density polyethylene pressure pipes with SANS 533-1 Part II.

The size of perforations in perforated pipes shall in all cases be 8 mm ±1,5 mm and spaced as shown on the drawings for the various sizes of pipes.

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 instructed by the Engineer.

(b) 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.

(c) Polyethylene sheeting.

Polyethylene sheeting shall be 0,15 mm thick Type C sheet complying with SANS 952.

(d) 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. The synthetic-fibre filter fabric shall be Grade 2 or approved equivalent.

(e) Composite in-plane drainage fabric

Wherever specified, composite in-plane drainage systems shall be constructed in accordance with the details shown on the drawings and the requirements of the Project Specifications.

M2205 MEASUREMENT AND PAYMENT

Item		Unit
M220.01	Excavation	
(a)	Excavating soft material	cubic metre (m^3)
(b)	Excavating hard material	cubic metre (m^3)

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 material as directed, including a free-haul of 1,0 km.

Item		Unit
M220.02	Impermeable backfilling	cubic metre (m^3)

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, including a free-haul of 1,0 km.

Item			Unit
M220.03	Natural permeable material		
(a)	Crushed stone obtained from commercial source		
	(i)	Fine grade	cubic metre (m^3)
	(ii)	Coarse grade	cubic metre (m^3)
(b)	Sand obtained from approved source on site		
	(i)	Fine grade	cubic metre (m^3)
	(ii)	Coarse grade	cubic metre (m^3)
(c)	Sand obtained from commercial source		
	(i)	Fine grade	cubic metre (m^3)
	(ii)	Coarse grade	cubic metre (m^3)

The unit of measurement shall be the cubic metre of approved crushed 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 crushed stone and sand.

Item			Unit
M220.04	Pipes		
(a)	Unplasticized PVC pipes and fittings, normal duty, complete with couplings		
	(i)	110 mm slotted pipe	metre (m)
	(ii)	150 mm slotted pipe	metre (m)
	(iii)	110 mm perforated pipe	metre (m)
	(iv)	150 mm perforated pipe	metre (m)
(b)	High density type polyethylene pressure pipes and fittings, normal duty, complete with couplings		
	(i)	110 mm	metre (m)
	(ii)	150 mm	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.

Item		Unit
M220.05	Polyethylene sheeting 0,25 mm thick	square metre (m^2)

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.

Item		Unit
M220.06	Synthetic fibre filter fabric (describe type and grade)	square metre (m^2)

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

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

Item		Unit
M220.07	Composite in-place drainage systems (state type, size and grade)	metre (m)

The unit of measurement shall be the metre of composite in-plane 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 composite in-plane drainage system complete as specified, but excluding the length of pipe installed.

Item		Unit
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 erection of markers.

Item		Unit
M220.09	Exposing of existing drains	cubic metre (m^3)

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.

Item		Unit
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.

Item		Unit
M220.11	Overhaul on material hauled in excess of 1,0 km	cubic metre kilometre (m^3.km)

The unit of measurement shall be the cubic metre of material hauled in excess of 1,0 km, 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 M2300: CLEANING OF WATERWAY STRUCTURES

CONTENTS

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, including the inlet and outlet areas.

A structure is classified as a waterway structure when the inlet area of the structure is greater than 5 m^2.

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 in the inlet and outlet areas, and silting of structure 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 instructed by the Engineer.

M2304 MEASUREMENT AND PAYMENT

Item		Unit
M230.01	Cleaning of waterway structures, inlet and outlets areas	
(a)	Cleaning of waterway structures, inlet and outlets areas	provisional sum (PS)
(b)	The Contractor's overhead charges and profit in respect of subitem M230.01 (a)	percentage (%)

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for sub-item M230.01 (b) is a percentage of the amount actually spent under sub-item M230.01 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

(c) Cleaning of waterway structures, inlet and outlet areas (performance based)

(i) Specify section and km distance including interchanges — month

The tendered rate per month shall include full compensation for removing the material and vegetation from the waterway structures, 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.

Item		Unit
M230.02	Overhaul on material hauled in excess of 1,0 km	cubic metre kilometre (m^3-km)

The unit of measurement shall be the cubic metre of material hauled in excess of 1,0 km, 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 M2400: CLEANING OF PREFABRICATED CULVERTS

CONTENTS

M2401 SCOPE

This section covers the cleaning of prefabricated culverts as well as surface drainage aspects of shallow culverts and waterway structures. 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 drawings. The work also involves the cleaning of waterway decks, scuppers and expansion joints.

The work shall either be executed on instruction or on a performance based basis as specified.

M2402 EXECUTION OF WORK

Culverts consist of prefabricated concrete, metal or plastic pipes with a circular section referred to as pipes, and prefabricated concrete culverts with a rectangular section referred to as box culverts. The different sizes of culverts shall be determined by diameter for pipes and height for box culverts.

All culverts and their inlet and outlet areas up to the road reserve boundary as shown on the drawings shall be kept clean.

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.

Where material is disposed of adjacent to the culverts, the material shall be spread neatly on areas where it cannot wash back into any culvert, drain or channel.

(a) Non-performance based criteria

The Contractor shall as part of his duties, inform the Engineer if he is of the opinion that any culvert and its inlet and outlet areas has more than 20% of its vertical height filled with silt or debris at any position of the culvert or at the inlet and outlet areas of the culvert .

The Engineer shall then instruct the Contractor regarding the cleaning of such culvert and its inlet and outlet areas up to the road reserve boundary.

Notwithstanding the preceding, the Engineer may also at any time instruct the Contractor to clean any culvert and its inlet and outlet area.

(b) Performance based criteria

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

M2403 ACCEPTANCE CRITERIA

(a) Non-performance based criteria

Culverts and their inlet and outlet areas shall be cleaned of all silt and debris such that all surfaces are clearly visible and accessible for inspection.

All spoil material shall be spread neatly and shall not wash back into any culvert, drain or channel.

(b) Performance based criteria

The culverts and their inlet and outlet areas shall be kept clean, not allowing more than 20% of its 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.

All spoil material shall be spread neatly and shall not wash back into any culvert, drain or channel.

M2404 INSPECTION OF CULVERTS FOR PAYMENT

(a) Non-performance based criteria

The contractor shall as part of his route patrol duties, inform the Engineer if he is of the opinion that any culvert and inlet and outlet areas do not comply with the acceptance criteria specified in clause M2403 of the Standard Specifications.

The Engineer shall then instruct the Contractor regarding the cleaning of such culvert and inlet and outlet areas.

Notwithstanding the preceding, the Engineer may also at any time instruct the Contractor to clean any culvert and inlet and outlet areas which, in his opinion, do not comply with the specified criteria.

If the Engineer instructs any work to be completed within a specified time, failure by the Contractor to comply within the completion time specified in the Project Specification shall render the Contractor liable for the penalty specified.

(b) Performance based criteria

Inspection for the cleaning will be based on the following:

- Inspection of the prefabricated culverts will be monthly.
- The different sections of the road shall be divided in 16 portions.
- 4 portions per section shall be inspected and the positions will be chosen randomly. (The same portions of road will apply for section M2500).
- If one prefabricated culvert in a portion does not comply with the acceptance criteria that portion fails. See M2403 and figure below.
- There will be no inspection for 5 working days after it has rained in the catchment area of the section of road identified for inspection.

The Contractor will be paid for the number of portions that pass inspection divided by 4 multiplied by the tendered rate per section.

Failure by the Contractor to meet the acceptance criteria shall render the Contractor liable for the penalty specified in Table C3.1.9/3 in Part C3 of the Project Specifications”

M2405 MEASUREMENT AND PAYMENT

Item			Unit
M240.01	Cleaning of prefabricated culverts, inlet and outlet areas(non-performance based)		
(a)	Route, section, km distances		
	(i)	Pipes with an internal diameter up to and including 750 mm	Number (No)
	(ii)	Pipes with an internal diameter exceeding 750 mm	Number (No)
	(iii)	Box culverts up to and including 1,5 m vertical dimension	Number (No)
	(iv)	Box culverts exceeding 1,5 m vertical dimension	Number (No)

The unit of measurement shall be the number of culverts, including the inlet and outlet areas as specified, which are cleaned on instruction of the Engineer. Distinction shall be made in terms of the diameter or the vertical dimension of the culverts.

The tendered rate shall include full compensation for cleaning the culvert and inlet and outlet areas, as specified.

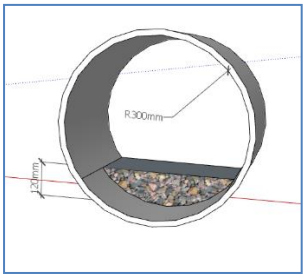
Item			Unit
M240.02	Cleaning of culverts (performance based)		
(a)	Initial cleaning of culverts		
	(i)	(specify route, section and km distances)	lump sum (LS)
(b)	Cleaning of culverts		
	(i)	(specify route, section and km distances)	month

The unit of measurement for subitem M240.02 (a) is the lump sum for the initial cleaning of culverts and their inlet and outlet areas, within the first two months of the contract period.

The unit of measurement for sub item M240.01 (b) is month for the cleaning of culverts and their inlet and outlet areas per section has been completed to specification.

The Contractor will be paid for the number of portions that pass inspection divided by 4 multiplied by the tendered rate per section. See M2404.

The tendered rate is per month and 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

This section covers the work in connection with the removal of silt, debris and vegetation causing obstruction to flow in concrete drains, inter alia, side drains, median drains, kerb-channelling combinations, down chutes and any other lined drains or channels (including stone pitched drains) and paved areas.

The work shall either be executed on instruction or on a performance based basis as specified in the Project Specifications.

M2502 EXECUTION OF WORK

Concrete drains consist of side drains, median drains, kerb-channelling combinations, down chutes and any other lined drains or channels (including stone pitched drains) and paved areas, and include their inlet and outlet areas, and manholes and grid inlets.

All concrete drains shall be kept clean of silt, debris and vegetation. The outlet area of concrete drains shall also be cleaned and material removed over a length of 10 m.

Vegetation growing in concrete drain joints and cracks shall be removed with their roots to prevent re-growth. Vegetation growing over concrete drains from the edges shall be slashed at the concrete drain edges and disposed of. Undesirable vegetation shall be removed with their roots and spoiled where directed by the Engineer.

Paved sidewalks and footpaths shall be cleared of all vegetation growing over the edges of the sidewalks and footpaths. Vegetation including branches of trees and shrubs growing along the footpaths and sidewalks shall be trimmed back to a vertical height of 2.0 m.

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

Where material is disposed of adjacent to the concrete drains, the material shall be spread neatly on areas where it cannot wash back into any culvert, drain or channel.

(a) Non-performance based criteria

The Contractor shall as part of his duties, inform the Engineer if he is of the opinion that any concrete drain does not have at least 90% of the design waterway capacity available.

The Engineer shall then instruct the Contractor regarding the cleaning of such concrete drain.

Notwithstanding the preceding, the Engineer may also at any time instruct the Contractor to clean any concrete drain.

(b) Performance based criteria

All drainage channels shall be cleaned initially within the first two months of the contract period and kept clean thereafter.

Silt and debris at manhole and grid inlets and concrete drain outlets shall be removed once a week during the rainy season and twice a month thereafter or as specified in the Project Specifications.

M2503 ACCEPTANCE CRITERIA

(a) Non-performance based criteria

Concrete drains shall be cleaned of any obstruction such that all surfaces are clearly visible and accessible for inspection.

(b) Performance based criteria

All concrete drains shall be kept clean, allowing at least 90% of the design waterway capacity to be available.

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

The vegetation growing on the sidewalks and footpaths shall not be more than 5% of the area of the sidewalk or footpath. Overhanging vegetation shall not be more than 5% of the length of the footpath or sidewalk.

M2504 INSPECTION OF CONCRETE DRAINS FOR PAYMENT

(a) Non-performance based criteria

Inspection for the cleaning of concrete drains will be done as and when required after the completion of the work by the Contractor.

If the Engineer instructs any work to be completed within a specified time, failure by the Contractor to comply within the completion time specified in the Project Specification shall render the Contractor liable for the penalty specified.

(b) Performance based criteria

Inspection for the cleaning will be based on the following:

- Inspection of the concrete drains and channels will be monthly.
- The different sections of the road shall be divided in 16 portions.
- 4 portions per section shall be inspected and the positions will be chosen randomly.
- If more than 2 positions per portion are identified that do not comply with the acceptance criteria that portion fails.
- There will be no inspection for 5 working days after it has rained in the catchment area of the section of road identified for inspection.

The Contractor will be paid for the number of portions that pass inspection divided by 4 multiplied by the tendered rate per section.

Failure by the Contractor to meet the acceptance criteria shall render the Contractor liable for the penalty specified in Table C3.1.9/3 in Part C3 of the Project Specifications."

M2505 MEASUREMENT AND PAYMENT

Item		Unit
M250.01	Cleaning of concrete drainage channels (non-performance based)	
(a)	Cleaning of concrete drainage channels	metre (m)
(b)	Cleaning of median concrete grid channels next to New Jersey barriers	metre (m)

The unit of measurement shall be the metre of concrete channel cleaned on instruction by the Engineer.

The tendered rate shall include full compensation for cleaning of concrete drains and channels, as specified.

Item		Unit
M250.02	Additional cleaning of concrete drainage channels (specify section and km distance including interchanges)	
(a)	Hand cleaning	Number (No)
(b)	Extra over M250.02(a) for work during night time	Percentage (%)

The unit of measurement shall be the number of additional cleaning of concrete drainage channels per section as specified on instruction of the Engineer, be means of sweeping using either a hand or machine operation.

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

No material shall be disposed of adjacent to the drainage channels.

Item		
M250.03	Cleaning of pedestrian paths on instruction of the engineer (specify section and km distance)	metre (m)

The tendered rate is per m and shall include full compensation for all labour and equipment required for removing the material and vegetation from pedestrian paths, irrespective of the geometrical layout of the pedestrian paths, as well as for all transport and labour.

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

No material shall be disposed of adjacent to the pedestrian paths.

Item		Unit
M250.04	Cleaning of concrete drains (performance based)	
(a)	Initial cleaning of concrete drains (specify section and km distance including interchanges)	LS
(b)	Cleaning of concrete drains (specify section and km distance including interchanges)	month

The unit of measurement for subitem M250.04 (a) is the lump sum for the initial cleaning of concrete drains, within the first two months of the contract period.

The unit of measurement for sub item M250.04 (b) is month for the cleaning of concrete drains per section has been completed to specification.

The Contractor will be paid for the number of portions that pass inspection divided by 4 multiplied by the tendered rate per section.

The tendered rate is per month and shall include full compensation for removing the material and vegetation from the concrete drains 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.

No material shall be disposed of adjacent to the drainage channels.

SERIES M2000: DRAINAGE MAINTENANCE

SECTION M2600: CLEANING AND MAINTENANCE OF EXISTING EARTH DRAINS

CONTENTS

M2601 SCOPE

This section covers the work involved in cleaning of all earth drains, repairs to damaged earth drains as well as construction and repairs of banks and dykes. This section also includes the excavation and construction of new earth drains.

M2602 EXECUTION OF WORK

(a) Drains

Earth drains consist of any side drains, median drains and channels.

Earth drains 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 into any culvert, drain or channel. 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 100 mm after compaction. The material shall be compacted to the density at which the penetration as measured by a DCP does not exceed 10 mm 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 the specifications.

New earth drains to the cross section as instructed by the Engineer shall be constructed where required. The excavated material shall be neatly spread and levelled in the road reserve or loaded, transported and spoiled as instructed by the Engineer.

(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 150 mm 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.

M2604 MEASUREMENT AND PAYMENT

Item		Unit
M260.01	Cleaning earth drains and channels	cubic metre (m^3)

The unit of measurement shall be the cubic metre of material cleaned out of the drain, calculated from the dimensions measured in place.

The tendered rate shall include full compensation for all labour and equipment required for removing the obstructions from drains, irrespective of depth of silt and debris and disposal of the excavated material as described, including a free-haul of 1,0 km.

Item		Unit
M260.02	Repairing of earth drains and channels	cubic metre (m^3)

The unit of measurement shall be the cubic metre of compacted material calculated from the dimensions measured in place.

The tendered rate shall include full compensation for trimming the eroded area to firm surrounding material, for procuring, placing and compacting the backfill material within a free-haul of 1,0 km.

Item		Unit
M260.03	Banks and dykes	cubic metre (m^3)

The unit of measurement shall be cubic metre of material in place in banks or dykes, calculated in accordance with authorised dimensions.

The tendered rate shall include full compensation for procuring, furnishing, placing, watering, compacting, shaping and trimming of material in the banks and dykes, including a free-haul of 1,0 km.

Item		Unit
M260.04	Construction of new earth drains	cubic metre (m^3)

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, and disposal of the material as directed, including a free-haul of 1,0 km.

Item		Unit
M260.05	Overhaul on material hauled in excess of 1,0 km	cubic metre kilometre (m^3.km)

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

The tendered rate shall include full compensation for hauling the material to spoil or from designated sources in excess of the free-haul distance.

SERIES M2000: DRAINAGE MAINTENANCE

SECTION M2700: EDGE BUILD-UP REMOVAL

CONTENTS

M2701 SCOPE

This section covers the work necessary for the removal of shoulder edge build-ups. The work shall either be executed on instruction or on a performance based basis as specified in the Project Specifications.

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 road surface, concentrating the water or presenting a potential hazard to traffic shall be removed. The material may be removed by means of blading using a grader or a tractor with a blade on instruction of the Engineer.

The finished surface of the edge build-up shall be free from corrugations, constructed level with the road surface edge, and shall not be higher than the surfaced edge.

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 into any culvert, drain or channel.

(a) Non-performance based criteria

The Contractor shall as part of his duties, inform the Engineer if he is of the opinion that any section of the road surface restricts the flow of water off the road surface.

The Engineer shall then instruct the Contractor regarding the removal of shoulder edge build-ups.

Notwithstanding the preceding, the Engineer may also at any time instruct the Contractor to remove shoulder edge build-ups.

(b) Performance based criteria

All shoulder edge build-ups shall be removed initially within the first two months of the contract period and kept clear thereafter.

M2703 ACCEPTANCE CRITERIA

(a) Non-performance based criteria

The road surface shall not have any shoulder edge material higher than the road surface which restricts the free flow of water off the road surface.

All spoil material shall be spread neatly and shall not wash back into any culvert, drain or channel.

(b) Performance based criteria

All material higher than the road surface which restricts the free flow of water off the pavement shall be removed not allowing a cumulative length of more than 10 m of edge build-up in any 1 km length of road inspected.

All spoil material shall be spread neatly and shall not wash back into any culvert, drain or channel.

M2704 INSPECTION OF EDGE BUILD-UP FOR PAYMENT

(a) Non-performance based criteria

Inspection for the removal of shoulder edge build-up will be done as and when required after the completion of the work by the Contractor.

If the Engineer instructs any work to be completed within a specified time, failure by the Contractor to comply within the completion time specified in the Project Specification shall render the Contractor liable for the penalty specified.

(b) Performance based criteria

Inspection for the removal of shoulder edge build-up will be based on the following:

(vi) Inspection of the edge build-ups will be done monthly.
(vii) The road will be broken up into 1 km sections for inspection.
(viii) 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 number of 4 sections shall be inspected and the positions will be chosen randomly. (The same sections of road will apply for sections M2400 and M2500).
(ix) If any section does not comply with the acceptance criteria that section fails.
(x) The Contractor will be penalised by the number of failed sections multiplied by the penalty amount as specified in the Project Specifications.

M2705 MEASUREMENT AND PAYMENT

Item		Unit
M270.01	Edge build-up removal	
(a)	Edge build-up removal	
	(i) Remove material by hand and dispose of adjacent to the road	metre (m)
	(ii) Remove material by hand and load for spoil	metre (m)
	(iii) Remove material by machine and dispose of adjacent to the road	kilometre (km)
	(iv) Remove material by machine and load for spoil	kilometre (km)
(b)	Overhaul on material hauled in excess of 1,0 km	cubic metre kilometre (m^3.km)

The unit of measurement for sub-items M270.01 (a)(i), (ii), (iii) and (iv) shall be the metre or kilometre of edge build-up removed on instruction of the Engineer.

The tendered rates shall include full compensation for labour, tools and equipment for the execution of the work, and disposal of the material including a free-haul of 1,0 km.

The unit of measurement for sub-item M270.01(b) shall be the cubic metre of material, the volume of material measured loose, hauled in excess of 1,0 km, multiplied by the overhaul distance.

The tendered rate shall include full compensation for hauling material in excess of 1,0 km.

Item			Unit
M270.02	Edge build-up removal (performance based)		
(a)	Initial edge build-up removal		
	(i)	(specify route, section and km distances)	lump sum (LS)
(b)	Edge build-up removal		
	(i)	(specify route, section and km distances)	month

The unit of measurement for subitem M270.02 (a) is the lump sum for the initial edge build-up removal, within the first two months of the contract period.

The unit of measurement for subitem M270.02 (b) is month for the edge build-up removal, and is payable only after the initial edge build-up removal per section has been completed to specification.

The tendered rates shall include full compensation for removing the material from the edge build-up, and for loading, transporting, off-loading, and spreading the material, and spoiling the material at designated spoil sites. Overhaul must be included in the rate as there will be no extra payment for overhaul in excess of the free-haul distance.

SERIES M2000: DRAINAGE MAINTENANCE

SECTION M2800: CONCRETE CHANNEL CONSTRUCTION AND MAINTENANCE OF EXISTING CHANNELS

CONTENTS

M2801 SCOPE

This section covers the construction of new concrete 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 concrete drains are to be constructed to improve drainage and will instruct where repairs to existing concrete 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 instructed 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 instruct 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 SANS 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 10 mm 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 specifications or details on the drawings.

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 be class 30/20. Non-structural concrete (backing and blinding) shall be class 15/20.

(b) Steel reinforcement

(i) Steel bars

Steel reinforcing bars shall comply with the requirements of SANS 920.

(ii) Welded steel mesh

Welded steel mesh shall comply with the requirements of SANS 1024.

M2805 MEASUREMENT AND PAYMENT

Item			Unit
M280.01	Excavation		
(a)	Open drains		
	(i)	Soft material	cubic metre (m^3)
	(ii)	Hard material	cubic metre (m^3)
(b)	Chutes and kerb-channel combination		
	(i)	Soft material	cubic metre (m^3)
	(ii)	Hard material	cubic metre (m^3)

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 1,0 km.

Item		Unit
M280.02	Cast in situ concrete	
(a)	Linings	cubic metre (m^3)
(b)	Chutes	cubic metre (m^3)
(c)	Channels for kerb and channel	cubic metre (m^3)
(d)	Concrete berms	cubic metre (m^3)

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 shown on the 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.

Item		Unit
M280.03	Concrete screed or backfill below chutes	cubic metre (m^3)

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.

Item		Unit
M280.04	Precast concrete kerbing and chutes	
(a)	Kerbing (specify type)	metre (m)
(b)	Chutes (specify class)	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.

Item		Unit
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 mesh 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.

Item		Unit
M280.06	Sealed joints in concrete lining of open drains (specify type 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.

Item		Unit

M280.07	Demolition and removal of damaged structures	
(a)	Plain concrete	cubic metre (m^3)
(b)	Reinforced concrete	cubic metre (m^3)
(c)	Kerbing and channelling	cubic metre (m^3)
(d)	Concrete berms (specify class)	cubic metre (m^3)

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 1,0 km.

The reinstatement of damaged sections shall be paid for under the relevant items for constructing new structures.

Item		Unit
M280.08	Down chutes	
(a)	Corrugated steel (specify type and diameter)	metre (m)
(b)	Plastic (specify type and diameter)	metre (m)
(c)	Concrete (specify type and diameter)	metre (m)

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.

Item		Unit
M280.09	Overhaul on material hauled in excess of 1,0 km	
(a)	Excavated material to spoil	cubic metre kilometre (m^3.km)
(b)	Existing structures demolished	cubic metre kilometre (m^3.km)

The unit of measurement shall be the cubic metre of material measured loose, hauled in excess of 1,0 km, multiplied by the overhaul distance.

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

Item		Unit
M280.10	Asphalt edge berms	ton (t)

The unit of measurement shall be the ton of asphalt placed in accordance with the specified requirements. The quantity will be computed in accordance with the certified weighbridge tickets issued. Payment will not be made for wasted material.

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.

SERIES M3000: ROADSIDE MAINTENANCE

SECTION M3100: FENCING

CONTENTS

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 1 m 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, changes in direction of 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. Gate posts shall not be used as straining posts but at each gate post 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 as 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 spacing 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 veldfires.

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 75 mm 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 tied to the fencing wire. The diamond mesh or wire netting shall be secured by means of soft binding wire at 1,2 m centres along the top and bottom wires and at 3 m 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 130 mm of the wire netting so that it lies flat on the ground and packing stones (minimum dimension 200 mm) end to end on this flap to secure it in position.

(ii) By embedding the lower 130 mm 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 channels 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 150 mm 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, 100 mm 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 need to be taken down or moved to a new location shall be dismantled. Material not required for re-erection or declared unsuitable for reuse 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.

Where fences require moving, the Contractor shall reuse 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 reused 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 gate posts, clear of the ground in all positions.

At pedestrian and security fences the double swing gates shall not leave a gap of more than 25 mm between them when closed and other gates shall not be further than 25 mm from the gate post when closed. The clearance below the gates shall not exceed 75 mm with the gates closed.

(h) Repairs to fences

In the case of fences that require repairing, the Contractor shall reuse 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. Unsuitable material shall be scrapped and removed from site at the Contractor's cost. The Engineer shall not be responsible for any delays or costs arising from breakage of reused wire during straining.

If more than 50% of the fence needs to be repaired the repair work will be paid as for a new fence.

(i) Closure of pedestrian thoroughfares

Where required by the Engineer pedestrian thoroughfares shall be closed off with concrete or steel security palisade fencing with a 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 10 mm 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 timber posts shall comply with the requirements of SANS 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 22 kg/m rails and galvanised. Standards shall be 2,50 kg/m Y-sections.

Droppers shall be 0,56 kg/m, ridgeback-pattern droppers.

Where tubular posts are specified they shall be galvanised in accordance with SANS 763 for Class B1 articles or shall be painted as specified and have a minimum wall thickness of 2,95 mm. The Engineer shall direct the length, diameter and hole spacing. All tubular sections shall be provided with a 230 mm x 230 mm footplate and a pressed-steel or cast-iron cap.

Rolled steel sections shall be provided with a protective coating of an approved material.

Tubular stays shall have a minimal bore of at least 60 mm and a wall thickness of at least 2,95 mm. They shall be galvanised as specified in SANS 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 12 mm. 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 SANS 675 and shall be one or more of the following types:

High tensile grade steel, galvanised, single-strand wire, oval shaped, 3,15 mm x 2,50 mm (2,82 mm equivalent diameter).

High tensile grade steel, galvanised, single-strand wire, oval shaped, 2,80 mm x 1,90 mm (2,31 mm equivalent diameter). This wire shall not be used less than 500 mm above ground where there is a danger of grass fires.

Mild steel grade, galvanised, double strand, uni-directional twist wire, each strand 2,50 mm diameter, for use at any height above ground.

Barbs shall be manufactured from 2,0 mm galvanised wire and shall be spaced at not more than 152 mm.

(ii) Razor tape wire

The product shall be fully galvanised and of high tensile grade steel.

(iii) Smooth wire

Smooth wire shall comply with the requirements of SANS 675 and shall be of the types specified below:

Straining wire shall be high tensile grade steel, 4,0 mm diameter, galvanised wire.

Fencing wire shall be high tensile grade steel, 2,24 mm diameter, galvanised wire.

Tying wire shall be 2,50 mm diameter, mild steel, galvanised wire for tying fencing wire to standards and droppers, and 1,60 mm 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 SANS 1373. The edge finish shall be clinched or barbed both sides.

The nominal diameter of the wire shall be 2,5 mm and the mesh size shall be 64 mm x 64 mm.

The wire shall be fully galvanised.

(e) Wire netting

Wire netting shall be fully galvanised mild steel wire with a minimum diameter of 1,8 mm and 75 mm 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 SANS 457 and shall be creosote impregnated in accordance with SANS 10005 with creosote complying with SANS 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 – 1,8 mm	0,05 mm
2,0 – 2,8 mm	0,08 mm
3,15 – 4,0 mm	0,10 mm

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)

(e) Steel palisade fences (of various heights).

(f) Concrete palisade fences (of various heights).

(g) Steel mesh fencing (as specified).

(h) Flat wrap barbed wire fencing.

Where existing fences have to be dismantled and re-erected in the same position, they shall be erected either to the same design as the original, but with such modifications as may be instructed by the Engineer, or they shall be erected to one of the standards specified above, all as ordered by the Engineer. Straining posts and standards are not 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

Item		Unit
M310.01	Clearing fence line	
(a)	2 m wide for new fences	kilometre (km)
(b)	1 m wide alongside existing fences	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.

Item		Unit
M310.02	Repair of existing fences of less than 100 m 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	
	(i) 1.2 m high	metre (m)
	(ii) 1.4 m high	metre (m)

	(iii) 1.8 m high	metre (m)
	(iv) 2.1 m high	metre (m)
	(v) 2.4 m high	metre (m)
(g)	Steel mesh fencing (as specified)	
	(i) 1.2 m high	metre (m)
	(ii) 2.0 m high	metre (m)
(h)	Flat wrap barbed wire fencing	metre (m)
(i)	Game Proof	metre (m)

The unit of measurement shall be the metre of each type of fence repaired.

The tendered rate shall include full compensation for all labour, tools, binding and tying wire for the repair of the fence, including transporting all labour, tools and materials from the Contractor's base to the point of the fence repaired.

The supply of fencing materials needed shall be included in the tendered price.

Item		Unit
M310.03	Repair of existing fences of greater than 100 m 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	
	(i) 1.2 m high	metre (m)
	(ii) 1.4 m high	metre (m)
	(iii) 1.8 m high	metre (m)
	(iv) 2.1 m high	metre (m)
	(v) 2.4 m high	metre (m)
(g)	Steel mesh fencing (as specified)	
	(i) 1.2 m high	metre (m)
	(ii) 2.0 m high	metre (m)
(h)	Flat wrap barbed wire fencing	metre (m)

The unit of measurement shall be the metre of each type of fence repaired.

If more than 50% in length of the fence needs to be repaired the repair work will be paid under item M310.04 as for a new fence.

The tendered rate shall include full compensation for all labour, tools, binding and tying wire for the repair of the fence, including transporting all labour, tools and materials from the Contractor's base to the point of the fence repaired.

The supply of fencing materials needed shall be included in the tendered price.

Item		Unit
M310.04	Erection of new fences of less than 1 km 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	
	(i) 1.2 m high	metre (m)
	(ii) 1.4 m high	metre (m)
	(iii) 1.8 m high	metre (m)
	(iv) 2.1 m high	metre (m)
	(v) 2.4 m high	metre (m)
(g)	Steel mesh fencing (as specified)	
	(i) 1.2 m high	metre (m)
	(ii) 2.0 m high	metre (m)
(h)	Flat wrap barbed wire fencing	metre (m)

The unit of measurement shall be the metre of each type of fence erected, including the erection of any temporary fencing required.

The tendered rate shall include full compensation for all labour, tools, binding and tying wire for the repair of the fence, including transporting all labour, tools and materials from the Contractor's base to the point of the fence repaired.

The supply of fencing materials needed shall be included in the tendered price.

Item		Unit
M310.05	Supply and erection of new fences of greater than 1 km	
(a)	Supply of fencing material	

	(i)	Supply and erection of new fences of greater than 1 km	provisional sum (PS)
	(ii)	Overhead charges and profit in respect of subitem M310.05 (a)(i)	percentage (%)
(b)	Concrete backfill		cubic metre (m^3)

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 for subitem M310.05 (a)(ii) is a percentage of the amount actually spent under subitem M310.05 (a)(i), which shall include full compensation for the overhead charges and profit of the Contractor.

The unit of measurement for subitem M310.05 (b) shall be the cubic metre of concrete placed as backfill around straining posts 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.

Item			Unit
M310.06	New gates		
(a)	Single leaf		number (No)
	(i)	Stock-proof fences	number (No)
	(ii)	Vermin-proof fences	number (No)
	(iii)	Pedestrian fences	number (No)
	(iv)	Security fences	number (No)
(b)	Double leaf		number (No)
	(i)	Stock-proof fences	number (No)
	(ii)	Vermin-proof fences	number (No)

The unit of measurement shall be the number of new gates erected. At pedestrian and security fences the pair of gates shall be measured as one.

The tendered rate shall include full compensation for procuring and furnishing all material, including gates, gate posts, hinges, bolts, 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.

Item			Unit
M310.07	Moving of existing fences and gates		
(a)	Fences		
	(i)	Stock-proof fences	metre (m)
	(ii)	Vermin-proof fences	metre (m)
	(iii)	Pedestrian fences	metre (m)

	(iv)	Security fences	metre (m)
	(v)	Steel palisade fences	metre (m)
	(vi)	Concrete palisade fences	metre (m)
	(vii)	Steel mesh fencing (as specified)	metre (m)
	(viii)	Flat wrap barbed wire fencing	metre (m)
(b)	Gates		number (No)

The unit of measurement for moving existing fencing shall be the metre of fence moved 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. The unit of measurement for moving of gates shall be the number of gates moved.

The tendered rate for each metre of existing fence moved, or for each existing gate moved, shall include full compensation for dismantling the old fence, coiling and stacking the material not suitable for reuse, moving all material, including posts and wire, and the re-erection of the fence or gate in the new position, and for providing binding, tying and straining wire. Additional new material used during the re-erection of the old fence shall be paid for under item M310.05.

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.

Item		Unit
M310.08	Dismantling of existing and damaged fences	metre (m)

The unit of measurement shall be the metre of existing and damaged fencing and gates taken down and dismantled.

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.

Item		Unit
M310.09	Drilling and blasting holes for posts and anchors	number (No)

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.

The tendered rate shall include full compensation for drilling and blasting the holes and for all other expenses in connection with providing, storing, transporting and using explosives.

Item		Unit
M310.10	Procurement of specialised fencing	
(a)	Procurement of specialised fencing (cattle grids)	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M310.10 (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 for subitem M310.10 (b) is a percentage of the amount actually spent under subitem M310.10 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M3000: ROADSIDE MAINTENANCE

SECTION M3200: COLLECTION AND REMOVAL OF DEBRIS AND LITTER

CONTENTS

M3201 SCOPE

This section covers the work involved in the collection and removal of all foreign articles, debris, litter, posters and illegal signs of size up to 0,5 m^2 from the road reserve, lay-byes and roadside stopping places as well as the emptying of rubbish bins at all these areas.

M3202 EXECUTION OF WORK

(a) Initial clearing of the road reserve

The Contractor shall, within the first two months of the contract period, clear the road reserve 100% of all foreign articles which, inter alia, shall include:

- Litter
- Branches
- All stones larger than 75 mm but smaller than 300 mm in diameter
- Building and garden rubble
- Spilled loads from vehicles
- Tyres and stripped tyre treads
- Posters
- Old and new posters glued to concrete structures
- Illegal signs up to 0,5 m^2
- Graffiti on concrete structures
- Accident debris

The road reserve shall be cleared from fence to fence, including interchanges, lay-byes, rest areas, side drains, all drainage grids, bridge drainage ports and scuppers and rubbish bins. This work must be completed before general clearing can commence.

(b) General clearing 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 75 mm but smaller than 300 mm in diameter
- Spilled loads from vehicles
- Tyres and stripped tyre treads
- Posters
- Illegal signs up to 0,5 m^2
- 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 debris and litter

Unless otherwise specified by the Engineer in the Project Specifications, the frequency for completing full width passes of the road and road reserve for collection of debris and litter shall generally be as follows:

- Urban roads: Once per week
- Peri urban roads: Twice per month
- Rural roads: Once per month

The collection and removal of debris and litter shall be undertaken by the Contractor continuously at the specified frequencies throughout the year, inclusive of the Contractor's customary holiday period in December and January.

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
- 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 Contractor shall report at site meetings the number of bags of debris and litter collected per calendar month.

The Engineer may instruct additional ad hoc clearing of the reserve and/or lay-byes, 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 shall ensure that all bottles, tins, inter alia hidden by grass and shrubs, are removed. Work shall be undertaken progressively along the road reserve.

Debris and litter 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.

(e) Other requirements

The Contractor shall report any damaged containers, tables and benches at lay-byes and rest areas to the Engineer.

M3203 ACCEPTANCE CRITERIA

The road reserve shall be inspected after the clearing operation and it shall be completely cleared of all debris and litter. Bags shall be removed and disposed of as specified and not left overnight.

The collected debris and litter 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 refuse containers cleared and benches and tables cleaned.

Failure by the Contractor to comply with the performance specifications shall render the Contractor liable for the penalties as specified in the Project Specifications.

M3204 MEASUREMENT AND PAYMENT

Item		Unit
M320.01	Initial clearing of the road reserve (specify section and km distance including interchanges)	lump sum (LS)

The unit of measurement shall be the lump sum for the initial clearing of the road reserve within the first two months of the contract period.

The tendered rate shall include full compensation for all labour, equipment, tools and transport necessary for the clearing of the road reserve as specified.

Item		Unit
M320.02	General clearing of the road reserve	
(a)	Urban roads (i) Specify section and km distance including interchanges	weekly
(b)	Peri urban roads (i) Specify section and km distance including interchanges	month
(c)	Rural roads (i) Specify section and km distance including interchanges	month

The tendered rate per month/week 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.

Item		Unit
M320.03	Additional ad hoc clearing	
(a)	Lay-byes	number (No)
(b)	Toll plazas (list the toll plazas)	number (No)
(c)	Interchanges (list the interchanges)	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 item M320.01.

SERIES M3000: ROADSIDE MAINTENANCE

SECTION M3300: SHOULDER REPAIRS

CONTENTS

M3301 SCOPE

This section covers the work necessary for reinstating the gravel shoulders of surfaced roads or gravel roads as well as work necessary for the preparation of the road reserve.

M3302 EXECUTION OF WORK

(a) Reinstatement of gravel shoulders

(i) Construction

Shoulder reinstatement shall be carried out where the gravel shoulder is 50 mm or more lower than the surfaced edge of the road and at busbays and stopping places where a shoulder drop off of more than 50 mm 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:

- Ripping of the existing shoulder material at least 150 mm deep, watering, placing and compacting of in situ shoulder material, from within the road reserve, without adding extra material from a borrow pit or commercial source.

- Construction of full depth gravel shoulder at least 150 mm thick with material from within the road reserve, with adding extra imported material from a borrow pit, commercial source or material originated from milling out existing pavement layers (mechanical modification).

- Construction of full depth gravel shoulder at least 150 mm thick with material from within the road reserve, with or without adding extra imported material from a borrow pit, commercial source or material originated from milling out existing pavement layers as well as the chemical (cement or lime) or bituminous (emulsion) stabilisation of the shoulder material. This method will require the specific approval of the Employer.

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 2,0 m from the edge of 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 50 mm.

Material shall not be compacted in layers exceeding a thickness of 150 mm, measured in 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^2 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.

(c) Repairing of shoulder drop-offs (cavity fills)

The Engineer may also order the localised repair of shoulder drop-offs. The existing shoulder material shall be ripped to a depth of at least 150 mm and maximum width of 1 m. Additional imported shoulder material that may be required shall be obtained from within the road reserve, or from a commercial source. Where stabilisation of the shoulder material may be required the specific approval of Employer must be obtained.. The watering, placing and compacting of shoulder material shall be approved by the Engineer.

(d) Preparation of road reserve

The Engineer may order the preparation of the road reserve to facilitate effective storm water drainage as well as to provide easy access for equipment such as mechanical mowers and balers, which are normally used in the control of vegetation growth.

Preparation of the road reserve will mainly include the following activities:

(i) Forming and shaping of trapezoidal type earth drains next to the road shoulder as specified, with a motor grader.

(ii) Blading of the road reserve area by using a motor grader to remove existing windrows, undesirable vegetation, stones, boulders and other debris.

Where ordered by the Engineer, useable material shall be stockpiled and/or used directly for the construction of earth berms and/or shoulders in the road reserve in order to improve the storm water drainage in the road reserve.

M3303 ACCEPTANCE CRITERIA

The reinstated gravel shoulder shall be compacted to 93% modified AASHTO density. Any surplus material resulting from the shoulder reinstatement work shall be removed completely and transported to spoil.

Blading and the preparation of the road reserve shall allow easy access for mechanical type equipment such as mowers and balers used in the control of vegetation growth. All stones and boulders larger than 75 mm in diameter, which could possibly damage the equipment, shall be

removed. Bladed shoulders and prepared storm water drainage (earth drains) shall also be clear of any obstructions with no ponding of water evident.

All the vegetation and rubble generated in the preparation process shall be removed and disposed of and/or stockpiled at a suitable site approved by the Engineer.

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. Only gravel material from soft excavation shall be utilised as shoulder material. Material originating from the milling out of existing pavement layers may also be used to reconstruct eroded shoulders.

Gravel shall comply with the requirements in TRH20 as in Table 3304/1.

TABLE 3304/1: MATERIAL SPECIFICATIONS FOR GRAVEL SHOULDERS	
Maximum size (mm)	37,5
Oversize index (I_o)[a]	≤ 5 %
Shrinkage product (S_p)[b]	100 – 365 (max. of 240 preferable)
Grading coefficient (G_c)[c]	16 – 34
Soaked CBR (at 95 per cent Mod AASHTO compaction)	≥ 15 %
Treton impact value (%)	20 – 65
a I_o = Oversize index (per cent retained on 37,5 mm sieve) b S_p = Linear shrinkage x per cent passing 0,425 mm sieve c G_c = (Percentage passing 26,5 mm - percentage passing 2,0 mm) x (percentage passing 4,75 mm) / 100	

Stabilising agents used shall comply with the respective requirements:

- Portland cement – SANS 471 (rapid hardening cement shall not be used)
- Road lime – SANS 824
- Stable grade bituminous emulsion (60% net bitumen) – SANS 309 (anionic)
  – SANS 548 (cationic)

M3305 MEASUREMENT AND PAYMENT

Item		Unit
M330.01	Reinstating gravel shoulders	
(a)	Ripping, watering, mixing, placing and compacting existing shoulders to 93 % of Mod AASHTO density	cubic metre (m^3)
(b)	Extra over subitem M330.01 (a) for adding extra material	
	(i) Borrow in road reserve (within free haul distance, 1,0 km)	cubic metre (m^3)
	(ii) Commercial source	cubic metre (m^3)
	(iii) Milled material	cubic metre (m^3)
(c)	Extra over subitem M330.01 (a) for stabilising material	cubic metre (m^3)
(d)	Extra over subitem M330.01 (a) for adding chemical stabilising agent	

	(i)	Ordinary Portland cement	ton (t)
	(ii)	Road lime (specify type)	ton (t)
(e)		Extra over subitem M330.01 (a) for adding bituminous stabilising agent	
	(i)	Anionic stable grade emulsion	litre (ℓ)
	(ii)	Cationic stable grade emulsion	litre (ℓ)
	(iii)	Other (specify)	litre (ℓ)

The unit of measurement for subitem M330.01 (a) shall be the cubic metre of compacted 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 disposing of the material, including a free-haul of 1,0 km.

The unit of measurement for subitem M330.01 (b) shall be the cubic metre of material added to the existing gravel shoulder to make up any shortfall of material for the reconstruction of shoulders. The quantity of extra material added shall be taken as 70% of the loose volume measured in the hauling trucks.

The tendered rate shall include full compensation for procuring the material from borrow pits or commercial sources, placing and spreading the material over the existing shoulders, including haul over a free-haul distance of 1,0 km.

The unit of measurement for subitem M330.01(c) shall be the cubic metre of compacted material stabilised.

The tendered rate shall include full compensation for adding the stabilising agent to the material of the gravel shoulders, and mixing it in.

The unit of measurement for subitems M330.01 (d) and (e) shall be the ton and litre respectively of stabilising agent used.

The tendered rates shall include full compensation for procuring and providing the stabilising agent, irrespective of the rate of application specified, and shall make allowance for the differences in mixing and compaction times specified for the various stabilising agents.

Item		Unit
M330.02	Blading of gravel shoulders	
(a)	Blading of gravel shoulders	kilometre (km)
(b)	Cutting of mitre drains	metre (m)

The unit of measurement of subitem M330.02 (a) 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 subitem M330.02 (b) shall be the 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
M330.03	Preparation of road reserve	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	kilometre (km)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	kilometre (km)

The unit of measurement shall be the kilometre of road reserve prepared on each section, measured along the centre of the road.

The tendered rate shall include full compensation for all the labour and equipment required to clear and shape the road reserve area, as well as the removal and disposal of all unsuitable materials generated by the process, including a free-haul of 1,0 km.

Item		Unit
M330.04	Overhaul on material hauled in excess of 1,0 km	cubic metre kilometre (m^3.km)

The unit of measurement shall be the cubic metre of material, the volume of material measured loose, hauled in excess of 1,0 km, multiplied by the 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 M3400: MAINTENANCE OF ARRESTOR BED

CONTENTS

M3401 SCOPE

This section covers the work necessary for the fluffing, levelling, removal of vegetation and litter, and replenishment of stone aggregate for arrestor beds.

M3402 EXECUTION OF WORK

(a) Fluffing

The Contractor shall fluff the arrestor bed after every vehicle entry and at least once a month to break up any densification of the stone aggregate. 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 breath of the bed followed by brooming stone back into the bed, and then raking smooth the surface.

(b) Removal of vegetation and litter

As part of the fluffing operation, the Contractor shall remove all vegetation such as weeds and grass growing in and spreading over the edges of the arrestor bed, and any litter from the arrestor bed.

(c) 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.

At least the entire one half of the arrestor bed shall be so cleaned in a single operation, which must be completed within 72 hours. The stone aggregate shall be thoroughly mixed before returning it to the arrestor bed.

(d) Accommodation of traffic

The Contractor shall make adequate provision of traffic accommodation during any maintenance operations, to ensure the safety of the travelling public and protection of his own resources. He shall ensure that all his equipment is kept at such a place where it will not be a hazard to the travelling public. The Contractor shall plan his operations to ensure that the arrestor bed is functional after each day's work.

(e) Replenishment of stone aggregate

The Contractor shall replenish the stone aggregate by adding new stone as

specified. This includes the removal of contaminated material and replacement thereof with new or re-cycled material.

(f) 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 in Table 3403/1:

TABLE 3403/1: GRADING LIMITS FOR ARRESTOR BED STONE	
Sieve Size (mm)	**Percentage passing through sieve by mass**
13,200	100%
9,500	88 – 100%
6,700	5 – 88%
0,075	0,5 – 5%

The maximum flakiness index, when tested in accordance with TMH 1 method B3, shall comply with the requirements in Table 3403/2.

TABLE 3403/2: MAXIMUM FLAKINESS INDEX	
Nominal size of aggregate	**Maximum flakiness index % Grade 1**
13,200	25
9,500	30
6,700	30

The aggregate crushing value (ACV) of the aggregate used shall not exceed 21 and the 10% FACT shall not be more than 200.

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

Item		Unit
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 (m^3)

The unit of measurement for sub-item M340.01(a) shall be the month. The tendered rate shall include full compensation for all labour, plant, tools and equipment necessary to fluff the arrestor bed and clean the drainage system.

The unit of measurement for sub-item M340.01(b) shall be the cubic metre of aggregate stone cleaned of fine material whether by dry or wet screening or washing.

The tendered rate shall include full compensation for all temporary traffic accommodation measures to close off the arrestor bed, removal of the stone, wet or dry screening, and/or washing it, and returning the stone to the arrestor bed. It shall include all labour, plant, tools, transportation and equipment necessary to clean the stone.

Item		Unit
M340.02	Establishment of screening sieve machine	Lump sum

The unit of measurement shall be the sum for the collection and establishment of the screening sieve machine including the provision of appropriate storage facilities at the Contractor's camp. (Note. The establishment at the arrestor beds and return to the Contractor's camp is included as part of the equipment in the monthly rate M340.01(a)).

The tendered rate shall include full compensation for all the labour, transport, loading, offloading, all inclusive to establish the screening sieve.

Item		Unit
M340.03	Replenishment of stone aggregate	
(a)	Replenishment of stone aggregate	provisional sum (PS)
(b)	Overhead charges and profit in respect of sub-item M340.03 (a)	percentage (%)

The item is for the procurement of stone, with the source and grading to be approved by the Engineer, and delivered to the arrestor bed and placing the material as specified.

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 M340.03 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M3000: ROAD SIDE MAINTENANCE

SECTION M3500: STABILISATION OF CUTTINGS

CONTENTS

M3501 SCOPE

This section covers the operations involved in the barring down of loose rock, and cleaning of loose rock and accumulated debris from the slopes of 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.

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 and 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 that 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 cutting face

Prior to any portion of a cutting face being barred down, the Contractor shall make available suitable equipment together with a qualified operator, with which a specialist representative of the Engineer 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 shall 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 shall continue with the barring down to the satisfaction of the Engineer's specialist representative, and he may be required to re-attempt to bar down sections of rock previously attempted or be required to re-attempt to dislodge specific individual blocks of rock as may reasonably be required by the Engineer's specialist representative. 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 shall 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 deposited on an adjacent section of rock surface previously cleaned. The Contractor shall remove any rock or debris so deposited at no extra cost and all rock surfaces shall be cleaned to the satisfaction of the Engineer.

M3505 SAFETY OF PUBLIC TRAFFIC

The Contractor shall 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. 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

Item		Unit
M350.01	Barring down of rock surfaces	
(a)	Height up to 5 m	square metre (m^2)
(b)	Height exceeding 5 m up to 10 m	square metre (m^2)

The unit of measurement shall be the square metre area of the rock surface barred down and cleaned. 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. Distinction shall be made for the height of the cutting measured from the outer edge of the road at the toe of the cutting.

The tendered rate shall include full compensation for access to the rock face, barring down of rock and cleaning of the cutting face, using suitable tools and equipment, adhering to safety and other statutory precautionary measures, labour, plant, materials and all other necessary incidentals to complete the work. The rate shall also include for all costs and delays for providing the Engineer's specialist representative with access to the rock face.

Item		Unit
M350.02	Disposal of rock debris	cubic metre (m^3)

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. The tendered rate shall include full compensation for transporting the excavated material, including a free-haul of 1,0 km.

Item		Unit
M350.03	Overhaul on material hauled in excess of 1,0 km	cubic metre kilometre (m^3.km)

The unit of measurement shall be the cubic metre of material, the volume of material measured as 50% of the loose volume, hauled in excess of 1,0 km, multiplied by the overhaul distance.

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

Item		Unit
M350.04	Stabilisation of cuttings by specialist service provider	
	(a) Stabilisation of cutting slopes by specialist	Prov.Sum (PS)
	(b) The contractor's overhead charges and profit in respect of subitem M350.04(a)	%

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 M350.04 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M4000: ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE

SECTION M4100: ERECTION AND REPAIR OF PERMANENT ROAD TRAFFIC SIGNS

CONTENTS

M4101 SCOPE

This section covers the erection of permanent road traffic signs which shall be of the standard regulatory, guidance, warning and information signs. It includes the repair and replacement of faded, non-reflective or damaged existing sign boards and reference marker boards.

The manufacture of road signs is regarded as specialist work and shall be undertaken by specialist subcontractors with relevant experience.

M4102 STORAGE AND HANDLING

All road signs or parts of road signs shall be so transported, handled and stored in a weatherproof storeroom as to prevent any damage and deformation.

Sign boards 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 sign boards to permit free air circulation and moisture evaporation. Contact of road sign boards 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) Specifications

The signs and shall be fabricated in accordance with the SADC Road Traffic Signs Manual except where otherwise specified, indicated on drawings or directed by the Engineer.

(b) Position

Road signs shall be erected in the positions shown on the drawings or indicated by the Engineer.

(c) 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 soilcrete, a 1:12 cement/soil mixture shall be made if so required by the Engineer. The soil or soilcrete mixture shall then be placed at optimum moisture content in 100 mm 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 shown on the drawings, and regarded as specialised structural work.

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.

(d) Erection

Road sign boards must be inspected by the Engineer and approved before the boards are taken from the site depot 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 in accordance with the SADC Road Traffic Signs Manual, and 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 sign board in 50 mm high letters and numbers for overhead signs and 25 mm 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 the Contractor's own cost.

(e) Field welding

All welding done during erection shall comply with the requirements for welding during manufacture.

(f) 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.

(g) 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.

Type of sign	Time for completion
R – Series	2 days
W – Series	2 days
G – Series	4 days after date of delivery
Information signs	4 days after date of delivery

(h) 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.

(i) Attachment of overlays

The type of the overlay to be used will be specified by the Engineer and will consist either of 1 mm thick Chromadek plate, colour matching pop-rivetted onto the existing sign plate, or similar approved.

Before the application of the overlay to any structure, the existing sign board shall be thoroughly cleaned.

(j) Dismantling and removal of road signs

Where the dismantling and removal of road signs are required, any concrete footings of existing signs shall be demolished to at least 200 mm below the adjacent ground level, and the timber or steel support structures shall be cut not less than 200 mm below the adjacent ground level. The site where the road signs have been dismantled and removed shall be restored, and all the resulting debris shall be disposed of at an approved dumping site provided by the Contractor.

(k) 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 200 mm 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.

(l) 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) Steel profiles

(b) Timber posts for road sign supports

Timber posts for road sign supports shall conform to the requirements of SANS 754, and shall be equal to or better than strength group B timber posts and shall be stamped with the SABSmds mark. The exposed surface of the timber post where cut and any holes drilled in the timber posts shall be re-treated with the approved preservative.

(c) Corrosion-protection tape

Corrosion-protection tape used between aluminium and steel shall be black PVC tape not less than 0,25 mm 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 3,5 kN/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 shall 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 reuse, 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

Item		Unit
M410.01	Erection or re-erection of road sign boards	
(a)	Area up to 2 m^2	square metre (m^2)
(b)	Area exceeding 2 m^2 up to 10 m^2	square metre (m^2)
(c)	Area exceeding 10 m^2	square metre (m^2)

(d)	Overhead sign boards	square metre (m^2)

The unit of measurement shall be the square metre of completed road sign erected.

The tendered rate shall include full compensation for attaching the road sign board to a road sign support structure, or to an overhead road sign support structure or to an overpass bridge and for all equipment, labour, supervision, nuts, bolts, transport, handling, inter alia necessary for the installation of the road sign board.

Item			Unit
M410.02	Hazard plates		
(a)	Hazard plate and post (W401/402)		
	(i)	600 mm x 150 mm	number (No)
	(ii)	800 mm x 200 mm	number (No)
	(iii)	1200 mm x 300 mm	number (No)
(b)	Hazard plate (W401/402)		
	(i)	600 mm x 150 mm	number (No)
	(ii)	800 mm x 200 mm	number (No)
	(iii)	1200 mm x 300 mm	number (No)
(c)	Hazard plate and post (W405/406)		
	(i)	450 mm x 450 mm	number (No)
	(ii)	600 mm x 600 mm	number (No)
	(iii)	900 mm x 900 mm	number (No)
(d)	Hazard plate (W405/406)		
	(i)	450 mm x 450 mm	number (No)
	(ii)	600 mm x 600 mm	number (No)
	(iii)	900 mm x 900 mm	number (No)

The unit measurement for subitem M410.02 (a) shall be the number of each size of W401 and W402 hazard plates including posts supplied and erected.

The tendered rate shall include full compensation for procuring, supplying and erecting the hazard plate and post complete in accordance with the details on the drawings.

The unit measurement for subitem M410.10 (b) shall be the number of each size of W401 and W402 hazard plates supplied and erected, where boards are missing or old boards only are to be replaced.

The tendered rate shall include full compensation for procuring, supplying and erecting the hazard plate complete in accordance with the details on the drawings.

The unit measurement for subitem M410.02 (c) shall be the number of each size of W405 and W406 hazard plates including posts supplied and erected.

The tendered rate shall include full compensation for procuring, supplying and erecting the hazard plate complete in accordance with the details on the drawings.

The unit measurement for subitem M410.10 (d) shall be the number of each size of W405 and W406 hazard plates supplied and erected, where boards are missing or old boards only are to be replaced.

The tendered rate shall include full compensation for procuring, supplying and erecting the hazard plate complete in accordance with the details on the drawings.

Item		Unit
M410.03	Reference marker boards	
(a)	Reference marker board and post	
	(i) km Triangular board	number (No)
	(ii) Board Drawing No SP-S-1-3/3	number (No)
(b)	Reference marker board	
	(i) km Triangular board	number (No)
	(ii) Board Drawing No SP-S-1-3/3	number (No)

The unit of measurement for sub-item M410.03 (a) 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 procuring and furnishing the reference marker boards and posts, and for all labour, excavation, backfilling with soil or concrete as may be necessary for completing the work in accordance with the details shown on the drawings.

Sub-item M410.03 (b) is for the provision of the reference marker board only excluding a post, where boards are missing or old boards only are to be replaced. The unit of measurement for sub-item M410.03 (b) shall be the number of reference marker boards only supplied and erected in accordance with the drawings. The tendered rate shall include full compensation for procuring and furnishing the reference marker boards only with bolts and nuts, and for all labour, as may be necessary for completing the work in accordance with the details shown on the drawings, and disposal of old material.

Item		Unit
M410.04	Road sign supports	
(a)	Steel tubing (specify diameter and wall thickness)	metre (m)
(b)	Timber	
	(i) 100 – 125 mm	metre (m)
	(ii) 125 – 150 mm	metre (m)
	(iii) 150 – 175 mm	metre (m)

(iv)	175 – 200 mm	metre (m)
(v)	200 – 225 mm	metre (m)

The unit of measurement for subitem M410.04 (a) for erecting ground mounted 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 subitem M410.04 (b) for erecting timber supporting structures shall be the metre of post used. Distinction is made for the top diameter of the post. Bolts and other accessories shall not be measured separately. 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 supplying and 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.

Item		Unit
M410.05	Excavation and backfilling for road sign supports	
(a)	Excavation and backfilling	cubic metre (m^3)
(b)	Extra over subitem M410.05 (a) for rock excavation	cubic metre (m^3)
(c)	Extra over subitem M410.05 (a) for soilcrete backfill	cubic metre (m^3)
(d)	Extra over subitem M410.05 (a) for concrete backfill	cubic metre (m^3)

The unit of measurement for subitem M410.05 (a) 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 0,15 m^2, irrespective of the actual size of the excavated hole MDS.

The tendered rate shall include full compensation for excavating, backfilling and compacting the backfill material, for the disposal of all surplus excavated material, and for providing the backfill material.

The unit of measurement for subitem M410.05 (b) shall be the cubic metre of in situ rock excavated within the excavation limits specified in subitem M410.05 (a).

The tendered rate shall include full compensation for the additional cost of excavating in rock.

The unit of measurement for subitem M410.05 (c) shall be the cubic metre of excavation backfilled with soilcrete, measured as specified for subitem M410.05 (a).

The tendered rate shall include full compensation for the additional cost of providing and mixing in cement in the backfill material.

The unit of measurement for subitem M410.05 (d) shall be the cubic metre of excavation backfilled with concrete, measured as specified for subitem M410.05 (a).

The tendered rate shall include full compensation for procuring and furnishing all materials, mixing, transporting, placing and compaction of the concrete as backfill material.

Item		Unit
M410.06	Dismantling, storing, and re-erecting road sign boards	
(a)	Area up to 2 m^2	number (No)
(b)	Area exceeding 2 m^2 up to 10 m^2	number (No)
(c)	Area exceeding 10 m^2	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.

Item		Unit
M410.07	Dismantling and storing road sign boards	
(a)	Area up to 2 m^2	number (No)
(b)	Area exceeding 2 m^2 up to 10 m^2	number (No)
(c)	Area exceeding 10 m^2	number (No)

The unit of measurement shall be the number of signs dismantled and stored in each size group.

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.

Item		Unit
M410.08	Removal of road sign supports	number (No)

The unit of measurement shall be the number of road sign supports removed.

The tendered rates shall include full compensation for removing the road sign supports, and restoring the location where they were removed. MDS part of M410.07 and transport + storing

Item		Unit
M410.09	Repair of road sign faces	square metre (m^2)

The unit of measurement shall be the square metre of sign face repaired. 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.

Item		Unit
M410.10	Attachment of overlays to existing road signs	
	(a) Retroreflective material	
	(i) SABS 1519 Class II material	square metre (m^2)
	(ii) SABS 1519 Class III material	square metre (m^2)
	(iii) SABS 1519 Class IV material	square metre (m^2)
	(iv) 1 mm thick chromadek plate only	square metre (m^2)
	(v) 1.4 mm thick Chromadek or approved plate as per SANS 1519-2	square metre (m^2)

The unit of measurement shall be the square metre of overlays attached to the existing sign board.

The tendered rate shall include full compensation for labour, transport and materials necessary for attaching the overlay to existing road signs.

Item		Unit
M410.11	Gravel drainage layer below road sign footings e/o on M410.05 mds	cubic metre (m^3)

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.

Item		Unit
M410.12	Procurement of road sign boards	
(a)	Procurement of road sign boards	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M410.12 (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 subitem M410.12 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M410.13	Erection and repairs of gantry structures	
(a)	Erection and repairs of gantry structures	provisional sum (PS)

(b)	Overhead charges and profit in respect of subitem M410.13 (a)	percentage (%)

The provisional sum is for the erection and repairs of gantry structures by specialist subcontractors.

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 subitem M410.13 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M410.14	Supply of Road signs	
	(a) Road Signs (R and TR – Series)	
	(i) 900 mm	number (No)
	(ii) 1200 mm	number (No)
	(b) Road Signs (W – Series)	
	(i) 1200 mm	number (No)
	(ii) 1500 mm	number (No)
	(c) Road Signs (TW – Series)	
	(i) 1200 mm	number (No)
	(ii) 1500 mm	number (No)

The unit measurement for subitem M410.14 (a) shall be the number of each size of R and TR Series signs. The tendered rate shall include full compensation for procuring, supplying and erecting the signs.

The unit measurement for subitem M410.14 (b) shall be the number of each size of W-Series signs supplied and erected. The tendered rate shall include full compensation for procuring, supplying and erecting the signs.

The unit measurement for subitem M410.14 (b) shall be the number of each size of TW-Series signs supplied and erected. The tendered rate shall include full compensation for procuring, supplying and erecting the signs.

SERIES M4000: ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE

SECTION M4200: ROAD SIGN CLEANING AND REMOVAL OF ILLEGAL SIGNS

CONTENTS

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 and 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 to not damage the road surface when positioning the truck.

(b) Illegal signs: removal

Only on the instruction of the Engineer shall illegal signs (> 0,5m^2) be removed and disposed of or stored if required. Illegal signs (up to 0,5m^2) shall be removed as part of the Contractor's debris and litter and/or route patrol obligations. 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

Item			Unit
M420.01	Road sign cleaning		
(a)	Cleaning of guardrail reflectors		
	(i)	Cleaning of guardrail reflectors (all types)	number (No)
	(ii)	Re-taping of standard guard rail reflectors Type V Diamond grade – (red both sides)	number (No)
(b)	Cleaning of road signs		
	(i)	Area up to 2 m^2	number (No)
	(ii)	Area exceeding 2 m^2 up to 10 m^2	number (No)
	(iii)	Area exceeding 10 m^2	number (No)
(c)	Cleaning of overhead road signs		number (No)
(d)	Cleaning of danger plates		
	(i)	W401/402	number (No)
	(ii)	W405/406	number (No)

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 the provision and application of the specified cleaning detergent. The Tendered rate shall include for the procurement of the tape and applying the tape to the satisfaction of the Engineer.

V-shaped reflective plates shall be manufactured from 1,5 mm thick mild steel plate to the dimensions shown on the drawings. When supplied with the galvanised guardrails, they shall also be galvanised and when supplied with painted guardrails, they shall be finished in white baked enamel. The outer surface shall be coated with diamond-grade retro-reflective material, which complies with the provisions of CKS 191 in the colours red/red as shown below. Holes for fixing shall be drilled before the reflective plates are galvanised or painted.

Item		Unit
M420.02	Removal of graffiti	
(a)	Road signs	square metres (m^2)
(b)	Structures	square metres (m^2)

The unit of measurement shall be the area of the restored surface cleaned.

The tendered rate shall include full compensation for all labour, cleaning materials, equipment,

transport and overheads necessary for restoration of the surfaces.

Item		Unit
M420.03	Painting of metal road sign elements	
(a)	Road sign supports	litre (ℓ)
(b)	Road sign frames	litre (ℓ)

The unit of measurement shall be the litre of road sign paint used as per the manufacturer's specifications.

The tendered rate shall include full compensation for the supply and application of one coat of the specified paint to the 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

Item		Unit
M421.01	Removal of illegal signs	
(a)	Signs within the road reserve	
(i)	Area exceeding 0,5 m^2 up to 2 m^2	number (No)
(ii)	Area exceeding 2 m^2 up to 10 m^2	number (No)
(iii)	Area exceeding 10 m^2	number (No)
(b)	Signs outside the road reserve	
(i)	Signs outside the road reserve	provisional sum (PS)
(ii)	Overhead charges and profit in respect of subitem M420.01 (b)(i)	percentage (%)

The unit of measurement for subitem M421.01 (a) shall be the number of illegal road signs removed 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 subitem 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 subitem M421.01 (b) (i) which shall include full compensation for the handling costs and profit of the Contractor.

SERIES M4000: ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE

SECTION M4300: ROADSTUDS

CONTENTS

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.

The work shall be undertaken by specialist subcontractors with relevant experience.

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.

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 adhesive shall be thoroughly mixed and applied as recommended by the manufacturer.

The Contractor shall ensure that the roadstuds are protected against impact until the adhesive has achieved the necessary strength.

(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 roadstuds shall not be fixed in the same positions where damaged roadstuds were removed, but installed 150 mm 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 roadstud. 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 SANS 1442 categories 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.

The installation as well as the roadstuds 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 and if three and more successive roadstuds 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.

M4305 MEASUREMENT AND PAYMENT

Item		Unit
M430.01	Procurement and installation of roadstuds	
(a)	Procurement and installation of roadstuds	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M430.01 (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 subitem M410.13 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M430.02	Removal of damaged roadstuds	
(a)	Surface type	
	(i) Bituminous pavements	number (No)
	(ii) Concrete pavements	number (No)
(b)	Embedded type	
	i) Bituminous pavements	number (No)
	(ii) Concrete pavements	number (No)

(c)	Glass type MDS	number (No)

The unit of measurement shall be the number of roadstuds removed.

The tendered rate shall include full compensation for all labour tools and transport necessary to remove the roadstud and for the disposal thereof. The tendered rate shall also include for backfilling the holes as specified.

Item		Unit
M430.03	Replacement of roadstuds	
(a)	Surface type with shank (specify type)	number (No)
(b)	Surface type without shank (specify type)	number (No)
(c)	Embedded type (specify)	number (No)

The unit of measurement shall be the number of roadstuds replaced

The tendered rate shall include full compensation for procurement, all labour tools and transport necessary to replace the roadstud as specified.

Item		Unit
M430.04	Cleaning of roadstuds	number (No)

The unit of measurement shall be the number of roadstuds cleaned

The tendered rates shall include full compensation for all labour, material and equipment necessary for cleaning the roadstuds. It shall include for the provision and application of the cleaning detergent.

SERIES M4000: ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE

SECTION M4400: GUARDRAIL ERECTION AND MAINTENANCE

CONTENTS

M4401 SCOPE

This section covers the supply and installation of new guardrails, and the maintenance of existing guardrails as well as the installation and repair of wire rope safety fence (WRSF). This will include guard rails on cross roads within the SANRAL road reserve.

M4402 EXECUTION OF WORK

(a) Erection of new guardrails

New guardrails shall be erected at locations as directed by the Engineer.

The holes for timber posts shall be of sufficient size to permit the proper setting of the posts and to allow sufficient room for backfilling the hole and tamping the filling. At least 1,0 m of a post shall be embedded in the ground.

The posts, spacer blocks and guardrails shall be completely erected and set true to line and level so that the guardrail will be at the required height above the level of the road shoulder.

Where jointed, the end of the guardrail which overlaps on the side of the traffic shall point in the direction of the traffic movement. The guardrail 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 guardrails 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 100 mm of compacted thickness.

The approach ends, where the guardrail 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 guardrails shall touch either the spacer block or the post where no spacer blocks are used. All splices of guardrails shall be at posts, and guardrails shall make contact over the entire area of the splice.

Guardrail 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 surfaces shall be arranged with the colours as shown on the drawings.

(b) Removing of damaged guardrails

The Engineer shall approve the removal of damaged guardrails.

(i) Removing the guardrails

All guardrails, reflective plates and end units shall be carefully dug out and the holes shall be filled and compacted in 150 mm layers. Items used for fixing, such as bolts, nuts 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 reuse, it shall first be unpacked for inspection by the Engineer for deciding which material will be suitable for reuse. Suitable material shall then be stored separately from material, which is unsuitable for reuse. Unsuitable material shall be scrapped and removed from site at the Contractor's cost.

(ii) Re-erection

The guardrails shall be erected in the positions as indicated and all the removed material suitable for reuse and as much supplementary new material as may be necessary shall be used. Re-erection shall be as specified for new guardrails, including fixing the retro-reflective plates.

(c) Realignment of existing guardrails

The Engineer may require that the horizontal and vertical alignments of existing guardrail lines be improved.

Some of the soil around the guardrail post shall be removed to loosen the posts prior to correcting the alignments. The raising of guardrails 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 guardrails.

(d) Installation and repair of wire rope safety fence (WRSF)

Wire rope safety fence shall be erected at locations as directed by the Engineer. The installation and re-tensioning of wire rope safety fence is regarded as specialised work and shall be executed by a specialist Contractor.

(i) Installation of wire rope safety fence

Wire rope safety fence shall be installed in accordance with the manufacturer's specifications and drawings.

The erection of the wire rope safety fence shall be completely erected as shown on the drawings and set true to line and level so that the wire rope safety fence will be at the required height above the level of the road shoulder. Posts shall be placed into steel sleeves in precast concrete post footings, unless otherwise shown on the drawings.

(ii) Repair and re-tensioning of wire rope safety fence

Repair or replacement of damaged parts, due to traffic accidents, shall be done as specified in the Project Specifications. Failure by the Contractor to

comply with these requirements will make him liable for penalties as specified in the Project Specifications.

The periodic re-tensioning of the wire rope safety fence is required. This shall be done by the manufacturer on instruction of the Engineer. On completion of the re-tensioning operation the manufacturer shall provide to the Engineer a re-tensioning certificate validating the work completed.

The manufacturer shall provide the Engineer with two installation and repair manuals specific to the WRSF for each contract.

M4403 ACCEPTANCE CRITERIA

All guardrail posts shall be rigid and vertical and the guardrail shall be firmly fixed to the post.

The completed guardrail shall have a neat appearance and shall not show any visible deviation from the required line and grade.

The guardrails shall overlap in the direction of traffic and the end wings bolted firmly on top of the guardrail.

The wire rope safety fence shall comply with the requirements for road safety barriers set out in the European CEN Standards (Comité Europeén de Normalisation).

The wire rope safety fence shall comply with the requirements of the impact tests as described in EN 1317 Road Restraint System with a containment level of N1. The required South African verifications certificates shall be provided.

M4404 MATERIALS

(a) Guardrails

Guardrails shall comply with the requirements of SANS 1350 and shall be supplied together with all bolts, nuts, washers and fixing materials required including the bolts for fixing the guardrails to the posts. The length of the guardrail will be measured according to its effective length equal to 3,81 m or 4,0 m.

Galvanising of guardrails, bolts, nuts and washers shall comply with SANS 763.

(b) Guardrail posts

(i) Timber posts

Timber posts shall be supplied in lengths as shown on the drawings and shall comply with the requirements of SANS 457 and shall carry the SANS mark.

Posts shall be shaped and drilled as shown on the drawings and shall have a top diameter of not less than 150 mm or more than 230 mm. 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 SANS 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 guardrail posts

Normally only timber posts shall be used for supporting the guardrails but under certain circumstances other types of posts may be required. The type and size of other posts shall be as shown on the drawings.

(c) Guardrail reflectors

V-shaped reflective plates shall be manufactured from 1,5 mm thick mild steel plate to the dimensions shown on the drawings. When supplied with the galvanised guardrails, they shall also be galvanised and when supplied with painted guardrails, 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.

(d) Wire rope safety fence (WRSF) materials

All materials inter alia cables, posts, footings, anchor blocks, reflectors and all other related and accompanying materials used in the installation and repair of wire rope safety fence must be provided by the manufacturer and meet the manufacturer's specifications. Materials must be readily available to the Contractor.

M4405 MEASUREMENT AND PAYMENT

Item		Unit
M440.01	Supply and erection of new guardrails	
(a)	3,81 m guardrails	metre (m)
(b)	4 m guardrails	metre (m)

The unit of measurement shall be the metre of guardrail erected in position excluding curved guardrails and end units, according to the length of guardrail.

The tendered rate shall include full compensation for furnishing all materials, except guardrails which will be procured under sub-item M440.08 (a)(i), and labour for erecting the guardrail complete with posts, spacer blocks, bolts, nuts, washers and reinforcing plates.

Item		Unit
M440.02	Supply and erection of new curved guardrails factory bent to a radius of less than 45,0 m	
(a)	3,81 m guardrails	metre (m)
(b)	4 m guardrails	metre (m)

The unit of measurement shall be the metre of curved guardrail erected in position and measured in place, according to the length of guardrail.

The tendered rate shall include full compensation for furnishing all materials, except guardrails which will be procured under sub-item M440. 08 (a)(i), and labour for erecting the guardrail complete with posts, spacer blocks, bolts, nuts, washers and reinforcing plates.

Item			Unit
M440.03	Extra over for erection of guardrail posts		
(a)	Additional posts for items M440.01 and M440.02		
	(i)	Timber post	number (No)
	(ii)	Steel post (specify type)	number (No)
	(iii)	Steel post (sigma post)	number (No)
(b)	Excavation in hard material		
	(i)	Timber post	number (No)
	(ii)	Steel post (specify type)	number (No)
(c)	Backfilling guardrail post with soilcrete		
	(i)	Timber post	number (No)
	(ii)	Steel post (specify type)	number (No)
(d)	Backfilling guardrail post with concrete		
	(i)	Timber post	number (No)
	(ii)	Steel post (specify type)	number (No)

The unit of measurement for sub-item M440.03 (a) shall be the number of additional guardrail posts erected in position and measured in place, according to the type of post. The tendered rate shall include full compensation for furnishing and erecting guardrail posts complete with spacer blocks, bolts, nuts, washers, and reinforcing plates.

The unit of measurement for sub-item M440.03 (b) shall be the number of holes excavated in hard material, which cannot be removed by mechanical auger or hand tools, according to the type of post. The tendered rate shall include full compensation for all materials, labour and equipment and all incidentals required for making holes in hard material.

The unit of measurement for sub-items M440.03 (c) and (d) shall be the number of guardrail posts backfilled with soilcrete or concrete, according to the type of post. The tendered rate shall include full compensation for provision of soilcrete or concrete for backfilling to guardrail posts as instructed by the Engineer or as detailed on the drawings.

Item			Unit
M440.04	End units		
(a)	End wings		
	(i)	3,81 m guardrail	number (No)
	(ii)	4 m guardrail	number (No)
(b)	Terminal sections in accordance with the drawings where single guardrail sections are used		
	(i)	3,81 m guardrail	number (No)

	(ii)	4 m guardrail	number (No)
(c)	Terminal sections in accordance with the drawings where double guardrail sections are used		
	(i)	3,81 m guardrail	number (No)
	(ii)	4 m guardrail	number (No)
(d)	Bull nose end units		
	(i)	3,81 m guardrail	number (No)
	(ii)	4 m guardrail	number (No)
(e)	End unit connecting to bridge barrier		number (No)

The unit of measurement shall be the number of end units of each type erected, according to the length of guardrail.

The tendered rates shall include full compensation for all labour, constructional equipment and material, except guardrails which will be procured under sub-item M440.08 (a)(i), required for installing the end units as shown on the drawings including posts, fittings and the bending of turned-down sections, excavations, backfilling and the removal of surplus backfilling.

Item		Unit
M440.05	Guardrail reflectors	number (No)

The unit of measurement shall be the number of guardrail reflectors installed.

The tendered rate shall include full compensation for supplying all materials and labour required for manufacturing, painting and fixing guardrail reflectors as specified and as shown on the drawings.

Item			Unit
M440.06	Removal of damaged guardrails and re-erection of guardrails with new material		
(a)	Guardrails		
	(i)	3,81 m guardrail	metre (m)
	(ii)	4 m guardrail	metre (m)
(b)	End wings		
	(i)	3,81 m guardrail	number (No)
	(ii)	4 m guardrail	number (No)
(c)	Terminal sections with single guardrails		
	(i)	3,81 m guardrail	number (No)
	(ii)	4 m guardrail	number (No)
(d)	Terminal sections with double guardrails		

	(i)	3,81 m guardrail	number (No)
	(ii)	4 m guardrail	number (No)
(e)	Extra over for providing additional guardrail posts		
	(i)	Timber post	number (No)
	(ii)	Steel post (specify type)	number (No)

The unit of measurement for sub-item M440.06 (a) shall be the metre of guardrails, according to the length of guardrail, 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-items M440.06 (b), (c) and (d) shall be the number of units removed and re-erected, according to the length of guardrail.

The tendered rates shall include full compensation for constructional equipment, labour and tools required to remove the items and re-erecting the guardrails as specified with new material, including loading, transporting between any two points on the site and off-loading the material.

The tendered rate shall also include for the loosening of bolts and the adjacent sections of guardrails in order to adjust their position to accommodate the new sections of guardrails.

The unit of measurement for sub-item M440.06 (e) shall be the number of additional guardrail posts erected in position and measured in place, according to the type of post. The tendered rate shall include full compensation for furnishing and erecting guardrail posts complete with spacer blocks, bolts, nuts, washers, and reinforcing plates.

Item			Unit
M440.07	Providing of new material		
(a)	Supply of new strait guardrails		metre (m)
(b)	Supply of new curved guardrails		metre (m)
(c)	Timber posts		number (No)
(d)	Spacer blocks		number (No)
(e)	Steel posts		number (No)
(f)	Guardrail reflectors		
	(i)	Type D1 (A)	number (No)
	(ii)	Type D1 (B)	number (No)
	(iii)	Type V	number (No)
(g)	End units		
	(i)	End wings	number (No)
	(ii)	Terminal sections for single guardrail sections	number (No)
	(iii)	Terminal sections for double guardrail sections	number (No)

	(iv)	Bull nose end units	number (No)

The unit of measurement for subitem M440.07 (a) shall be the effective metre of guardrail erected in position excluding end units.

The unit of measurement for subitem M440.07 (b) shall be the effective metre of curved guardrail erected in position excluding end units.

The unit of measurement for sub-items M440.07 (b), (c) and (d) shall be the number of additional items provided such as posts, spacer blocks and guardrail reflectors.

The unit of measurement for subitem M440.07 (f) shall be the number of end units of each type erected.

Item		Unit
M440.08	Drilling and blasting holes for guardrail posts	number (No)

The unit of measurement for M440.08 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.

Item		Unit
M440.09	Reinstatement of concrete to guardrail posts (specify class)	cubic metre (m^3)

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.

Item			Unit
M440.10	Realignment of guardrails		
	(i)	3,81 m guardrail	metre (m)
	(ii)	4 m guardrail	metre (m)

The unit of measurement shall be the metre of guardrail realigned in position, according to the length of guardrail.

The tendered rate shall include full compensation for labour, tools, equipment and materials required for the realignment of guardrails as specified.

Item		Unit
M440.11	Painting of guardrails	metre (m)

The unit of measurement shall be the metre of guardrails painted. The tendered rate shall include full compensation for all labour, material and equipment required for the cleaning and painting (with an appropriate galvanised paint) of the guardrail.

Item		Unit
M440.12	Installation of wire rope safety fence	
(a)	Installation of wire rope safety fence	provisional sum (PS)
(b)	Handling costs and profit in respect of sub-item M440.12 (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 subitem M440.12 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M440.13	Procurement of wire rope safety fence materials	
(a)	Procurement of wire rope safety fence materials	provisional sum (PS)
(b)	Handling costs and profit in respect of sub-item M440.13 (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 M440.13 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M440.14	Repair of damaged wire rope safety fence and re-erection of wire rope safety fence with recovered, renovated or new material	
(a)	Repair of wire rope safety fence installation	metre (m)
(b)	Post footings	number (No)
(c)	Anchor blocks	number (No)

The unit of measurement for subitem M440.14 (a) shall be the metre of wire rope safety fence repaired and shall be measured between the two posts that are not damaged. The tendered rate shall include full compensation for all labour, equipment and traffic accommodation required for the removal of damaged wire rope safety fence and re-erection of wire rope safety fence with recovered, renovated or new material which will be procured under subitem M440.13 (a).

The unit of measurement for subitems M440.14 (b) and (c) shall be the number of post footings and anchor blocks repaired. The tendered rate shall include full compensation for the removal of damaged post footings and anchor blocks and disposal thereof, and all labour, equipment and material required for the installation of new post footings and anchor blocks which will be procured under subitem M440.13 (a). All repairs must be done to the specifications of the relevant patent holder.

Item		Unit
M440.15	Re-tensioning of wire rope safety fence	number (No)

The unit of measurement shall be the number of re-tensioning of wire rope safety fence installations. The tendered rate shall include full compensation for all labour, material, equipment and traffic accommodation required for the re-tensioning of a single installation of wire rope safety fence, between a set of anchor blocks. The re-tensioning of wire rope safety fence shall be done on instruction of the Engineer and payment will only be made once the supplier has issued a tensioning certificate to the Engineer. All repairs must be done to the specifications of the relevant patent holder.

Item		Unit
M440.16	Installation and repair of Impact Attenuators – Crash Cushions	
(a)	Installation and repair of Impact Attenuators	Prov Sum (PS)
(b)	Contractor's overhead charges and profit In terms of subitem M440.16(a)	%

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 M440.16 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M440.17	Repairing of damaged wire rope safety fence	
(a)	Safe Fence materials	
(i)	Stainless steel rigging screws	number (No)
(ii)	Stainless steel swage fittings	number (No)
(iii)	Stainless steel flat bar to end anchor	number (No)
(iv)	Galvanised steel post	number (No)
(v)	Stainless steel stiffening frame	number (No)
(vi)	Steel spreader to end post	number (No)
(vii)	Plastic spreader	number (No)
(viii)	Plastic ground cover	number (No)
(ix)	Plastic post caps	number (No)
(x)	Reflective strips to post caps (Grade 3 High intensity)	number (No)
(xi)	Reflective strips to post (Grade 3 High intensity)	number (No)
(xii)	Plastic ties to post caps	number (No)
(xiii)	Galvanise wire rope per metre	metre (m)
(xiv)	End anchor frames galvanised	number (No)
(xv)	Pre cast footings 200 diameter x 600	number (No)
(b)	**Brifen materials (Highway Safety Products)**	
(i)	Wire rope including threaded terminals	Metre (m)
(ii)	Wire rope excluding threaded terminals	Metre (m)
(iii)	Threaded terminals, excluding swaging	number (No)
(iv)	Rigging screw	number (No)
(v)	Safety check rope	number (No)
(vi)	Rope Connection	number (No)
(vii)	Line post "S" type	number (No)
(viii)	Deflection post "S" type	number (No)
(ix)	Locating peg (6mmx25mm galv. bolt & nut)	number (No)

(x)	Cap & reflective material	Number (No)
(xi)	Pre cast socket with galvanised sleeve	Number (No)
(xii)	Excluder / Dust cover	Number (No)
(xiii)	End anchor frame “Z” type	Number (No)
(xiv)	Cast in situ anchor complete	Number (No)
(xv)	Repair of Wire Rope safety fence Installations	Number (No) metre (m)

(c) Placement of Concrete Barriers

(i)	Loading of barriers	metre (m)
(ii)	Offloading of barriers	metre (m)
(iii)	Levelling and placing of barriers in position	metre (m)
(iv)	Tying barriers together (Doweling)	metre (m)
(v)	Overhaul for transport barriers	m-km

The unit of measurement for sub-items M44.17 (a) and (b) shall be the number and meter of new items provided for the repairing of wire rope safety fence.

The unit of measurement for sub-item M440.17 (b)(xv) shall be the metre of wire rope safety fence repaired and shall be measured between the two posts that are not damaged. The tendered rate shall include full compensation for all labour, equipment and traffic accommodation required for the removal of damaged wire rope safety fence and re-erection of wire rope safety fence with recovered, renovated or new material which will be procured under sub-item PM440.17 (a) and (b). The tendered rates shall include full compensation of transporting the repair team and equipment to and from the point of incidence.

SERIES M4000: ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE

SECTION M4500: DAZZLE SCREEN ERECTION AND REPLACEMENT

CONTENTS

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 the 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

Item		Unit
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.

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.

Item		Unit
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.

Item		Unit
M450.03	Removal of 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 site depot, and off-loading 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

This section covers the permanent marking and maintenance of white, yellow and red painted lines and symbols on the road surface.

The work shall be undertaken by specialist subcontractors with relevant experience.

M4602 MATERIALS

(a) Paint

(i) Road marking paint

Road marking paint shall comply with the requirements of SANS 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 SANS 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 SANS 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 SANS 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 SANS, confirming that the beads form part of a lot tested by the SANS and comply with the requirements of CKS 192. Alternatively, the Contractor shall at all times have a SANS certificate on the site, identifying the batches to which the inspection seals apply and certifying that they have been tested by the SANS, 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 10ºC, 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 5,0 km/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 1,5 m apart. Normally spots of approximately 10 mm 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 pre-markings 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^2 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 0,8 kg 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 10 mm.

(b) Position

The position of lines, letters, figures, arrows and other markings shall not deviate from the true or existing position by more than 100 mm in the longitudinal and 20 mm 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 10 mm in 15 m.

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 100 mm in the longitudinal direction nor 10 mm in the transverse direction from the existing marking.

The alignment of the roadstuds shall not deviate from the true alignment by more than 10 mm 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 150 mm 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 spilt paint will not 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 SANS 731 -1 under the appropriate sampling and testing methods. The sampling methods described in TMH5 shall be followed where applicable.

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, Volume 2, Chapter 13.

Traffic cones shall not be smaller than 750 mm in height and shall be placed on the road not further than 48 m 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

Item		Unit
M460.01	Road marking paint	
(a)	White lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)
	(ii) 150 mm wide	kilometre (km)
	(iii) 200 mm wide	kilometre (km)
	(iv) 300 mm wide	kilometre (km)
	(v) 500 mm wide	kilometre (km)
(b)	Yellow lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)
	(ii) 150 mm wide	kilometre (km)
	(iii) 300 mm wide	kilometre (km)
(c)	Red lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)

	(ii) 150 mm wide	kilometre (km)
	(iii) 300 mm wide	kilometre (km)
(d)	White lettering and symbols	square metre (m²)
(e)	Red lettering and symbols	square metre (m²)
(f)	Transverse lines, painted island, kerbs and arrestor bed markings (any colour)	square metre (m²)

Item		Unit
M460.02	Retro-reflective road marking paint	
(a)	White lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)
	(ii) 150 mm wide	kilometre (km)
	(iii) 200 mm wide	kilometre (km)
	(iv) 300 mm wide	kilometre (km)
	(v) 500 mm wide	kilometre (km)
(b)	Yellow lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)
	(ii) 150 mm wide	kilometre (km)
	(iii) 300 mm wide	kilometre (km)
(c)	Red lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)
	(ii) 150 mm wide	kilometre (km)
	(iii) 300 mm wide	kilometre (km)
(d)	White lettering and symbols	square metre (m²)
(e)	Red lettering and symbols	square metre (m²)
(f)	Transverse lines, painted island, kerbs and arrestor bed markings (any colour)	square metre (m²)

Item		Unit
M460.03	Plastic road marking material (specify particulars)	
(a)	White lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)
	(ii) 150 mm wide	kilometre (km)
	(iii) 200 mm wide	kilometre (km)
	(iv) 300 mm wide	kilometre (km)
	(v) 500 mm wide	kilometre (km)
(b)	Yellow lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)
	(ii) 150 mm wide	kilometre (km)
	(iii) 300 mm wide	kilometre (km)
(c)	Red lines (broken or unbroken)	
	(i) 100 mm wide	kilometre (km)
	(ii) 150 mm wide	kilometre (km)
	(iii) 300 mm wide	kilometre (km)
(d)	White lettering and symbols	square metre (m^2)
(e)	Red lettering and symbols	square metre (m^2)
(f)	Transverse lines, painted island, kerbs and arrestor bed markings (any colour)	square metre (m^2)

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, painted island, kerbs 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, transverse lines, painted island, kerbs 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, kerbs and arrestor bed markings, but excluding setting out and pre-marking the lines.

Item		Unit
M460.04	Setting out and pre-marking lines	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 500 mm, the setting-out of lines shall be measured only once.

The tendered rate shall include full compensation for setting out and pre-marking the lines as specified, including all materials.

Item		Unit
M460.05	Removal of existing, temporary or permanent road markings by:	
(a)	Sandblasting	square metre (m²)
(b)	Over-painting as temporary measure	square metre (m²)

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.

Item		Unit
M460.06	Road markings	
(a)	Road markings	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem 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 subitem M460.06 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Items M460.01 to M460.05 are payment items for small projects less than R50,000.00 in value, whereas item M460.06 is for road marking undertaken in one operation on a section of road with a value of at least R50,000.00 on instruction of the Engineer.

SERIES M4000: ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE

SECTION M4700: MAINTENANCE OF LAY-BYES AND REST AREAS

CONTENTS

M4701 SCOPE

This section covers the work in connection with the maintenance of lay-byes and rest areas.

M4702 EXECUTION OF WORK

The replacement of damaged refuse containers, tables and benches, or installation of new infrastructure shall be undertaken on instruction of the Engineer in accordance with the specifications and drawings.

M4703 ACCOMMODATION OF TRAFFIC

The cost of the accommodation of traffic for this section is included in the provisional sum of subitem M470.01 (a).

M4704 MEASUREMENT AND PAYMENT

Item		Unit
M470.01	Maintenance of lay-byes and rest areas	
(a)	Maintenance of lay-byes and rest areas	provisional sum (PS)
(b)	Overhead charges and profit in respect of sub-item M470.01 (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 M470.01 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M4000: ROAD TRAFFIC SIGNS AND ROADSIDE FURNITURE

SECTION M4800: ELECTRICAL FACILITIES

CONTENTS

M4801 SCOPE

This section covers the work in connection with the installation and maintenance of electrical facilities such as traffic signals, flashing lights and street lighting. The work shall be undertaken by specialist subcontractors.

M4802 EXECUTION OF WORK

(a) Any work on electrical facilities shall only be undertaken by an electrical subcontractor. The work shall be carried out in terms of the requirements of the Occupational Health and Safety Act and Regulations, 1993 (Act No 85 of 1983), Electrical Installation Regulations and Electrical Machinery Regulations.

(b) The installation of new electrical facilities includes traffic lights, traffic detector loops, and flashing lights. It also includes the installation of street lights at intersections, bridges and areas where there are high volumes of traffic and pedestrians. Electrical kiosks, meters, junction boxes and cabling in conduits and trenches will be required. The work shall be undertaken according to the specifications and drawings.

(c) The maintenance of electrical facilities will include attending to faulty installations, bulb replacement, and reinstatement of electrical connections where these may have been damaged or stolen. Special protective measures may be required to secure existing electrical facilities to prevent theft or vandalism thereof.

(d) All work areas shall be suitably protected and secured from any unauthorised entry of the public. Adequate warning signage shall be provided.

M4803 ACCEPTANCE CRITERIA

The installation and maintenance of electrical facilities shall comply with the regulations and requirements, and shall be suitably secured to prevent any damage to infrastructure or harm to anyone.

The site shall be left neat and tidy, and all debris removed. Any temporary accesses constructed and trenches or excavations backfilled, shall be treated as instructed by the Engineer.

M4804 MEASUREMENT AND PAYMENT

Item		Unit
M480.01	Installation, Maintenance and Security of electrical facilities	
(a)	Installation, Maintenance and Security of electrical facilities	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M480.01 (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 subitem M480.01 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M5000: PROTECTION WORK

SECTION M5100: GENERAL EROSION PROTECTION

CONTENTS

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 and concrete paving
- Stone masonry walls
- Concrete grass blocks
- Concrete paving
- Riprap
- Precast concrete block retaining walls

(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 Specifications before constructing the protective covering. Generally the areas shall be prepared by excavating, shaping and trimming and by thoroughly compacting the area by hand ramming 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 shall 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 in the spaces between rocks, 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 axes 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 stones 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 tuffs of grass shall then be planted in the topsoil between stones and watered immediately and copiously and thereafter at regular intervals until the grass has been established.

(ii) 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.

(iii) Wired-and-grouted stone pitching

Pitching shall be held in position at the bottom and top with wire nets with 150 mm mesh. The bottom net with the wire ties at 600 mm 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.

(iv) Grouted pitching on a concrete bed

The concrete bed (15/19 MPa concrete) with a thickness of at least 75 mm shall be placed first. The stone pitching shall be stones with a minimum dimension of 200 mm 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.

(c) Riprap

Riprap shall consist of a course or courses of large rock placed on bank slopes and toes in stream and river beds 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 150 mm 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.

(d) Stone masonry walls

Stone masonry walls shall be either plain packed stone walls with dry joints or mortared stone walls with stones bedded in cement mortar.

The minimum mass of each stone used shall be 10 kg and its minimum dimension 75 mm. Unless otherwise directed by the Engineer stones 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 stones 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 coping stones.

(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.

(e) 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 150 mm 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 50 mm. 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 afford 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 2 mm and 6 mm 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 Hz to100 Hz and a low amplitude. Its plate surface shall be 0,2 m² to 0,4 m² and shall develop a centrifugal force of 7 kN to 16 kN.

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 mortar 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 hydro seeding.

(f) Cast in situ concrete paving

The areas for cast in situ concrete paving 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. Plastic sheeting (thickness to be specified) shall be used on instruction of the Engineer before concrete is placed. Reinforcing mesh (size specified) shall also be used when constructing cast in situ concrete paving.

The type of concrete used shall unless otherwise specified, be Class 20/19 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 paving shall be cured for at least seven days and no traffic shall be allowed to move across the paving before the specified 28-day strength has been reached.

(g) 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 200 mm 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 SANS 50197-1 and SANS 50413-1.

(c) Sand

(i) Sand for concrete

Sand for concrete, cement slurry and cement mortar shall comply with the requirements of SA~~B~~NS 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 for joints

Sand used for being brushed into joints between pavement blocks shall all pass through a 1,18 mm sieve and between 10 and 15 per cent of it shall pass through a 0,075 mm sieve.

(d) Paving blocks

Paving blocks shall comply with the requirements of SANS 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 SANS 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 have been specified in the Bill of Quantities or in the Project Specifications.

Paving blocks for sidewalks shall be square fabricated concrete blocks, 450 mm x 450 mm 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 4,0 mm diameter galvanised wire, which complies with the requirements of SANS 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.

(i) Precast concrete block retaining walls

The precast concrete blocks shall be specified by the Engineer.

(j) Biodegradable protection

The biodegradable protection shall be specified by the Engineer.

M5105 MEASUREMENT AND PAYMENT

Item			Unit
M510.01	Stone pitching		
(a)	Plain pitching		
	(i)	Method 1	square metre (m²)
	(ii)	Method 2	square metre (m²)
(b)	Grouted pitching		square metre (m²)
(c)	Wired-and-grouted pitching		square metre (m²)
(d)	Grouted pitching on a concrete bed (specify total thickness)		square metre (m²)

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 weep holes 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.

Item		Unit
M510.02	Riprap	

(a)	Packed riprap (specify critical mass of stone)	cubic metre (m^3)
(b)	Dumped riprap (specify critical mass of stone)	cubic metre (m^3)
(c)	Filter backing	
	(i) Crushed stone	cubic metre (m^3)
	(ii) Filter sand	cubic metre (m^3)
(d)	Synthetic-fibre filter fabric (specify type, class and grade)	square metre (m^2)

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-fibre 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.

Item		Unit
M510.03	Foundations	
(a)	Excavation of foundation trenches	cubic metre (m^3)
(b)	Concrete foundation	cubic metre (m^3)

The unit of measurement for subitem M510.03 (a) 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.

The unit of measurement for subitem M510.03 (b) 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.

Item		Unit
M510.04	Stone masonry walls	
(a)	Plain packed stone	cubic metre (m^3)
(b)	Cement-mortared stone walls	cubic metre (m^3)

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.

Item		Unit
M510.05	Precast concrete block retaining walls	

(a)	Precast concrete block retaining walls	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M510.05 (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 subitem M510.05 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M510.06	Concrete paving and block paving	
(a)	Cast in situ concrete paving (specify class of concrete and thickness of paving)	square metre (m^2)
(b)	Segmented block paving (specify type and thickness)	square metre (m^2)
(c)	Prefabricated concrete grass blocks	square metre (m^2)
(d)	Prefabricated concrete paving blocks for sidewalk pavement (specify thickness)	square metre (m^2)

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 paving, including normal formwork and the shaping of surfaces and for all other work necessary for completing the work as specified.

Item		Unit
M510.07	Concrete edge beams	cubic metre (m^3)

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.

Item			Unit
M510.08	Spraying of vegetation destroyer and ant poison		
(a)	Herbicide		
	(i)	Selective (Contractor to specify brand name)	litre (ℓ)
	(ii)	Non-selective (Contractor to specify brand name)	litre (ℓ)
(b)	Ant poison (Contractor to 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.

Item		Unit
M510.09	Biodegradable fabric	
(a)	Biodegradable woven fabric, jute yarn	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M510.09 (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 subitem M510.09 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M5000: PROTECTION WORK

SECTION M5200: GABION PROTECTION

CONTENTS

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 300 mm 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 SANS 675 for mild-steel wire and shall be galvanised in accordance with the provisions of SANS 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 indicated in Table 5203/1:

TABLE 5203/1: GABION SIZES (MESH AND WIRE)

Depth of gabion (m)	Mesh size (mm)	Wire diameter (mm)
0,5 and over	80 x 100	2,5
	100 x 120	2,7
0,2 – 0,3	80 x 100	2,2

Other combinations of mesh size and wire diameter may be used when specified in the Project Specifications.

(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 0,5 mm and the minimum thickness shall be 0,4 mm. 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) Geotextile

The geotextile 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.

Rock fragment shall comply with the rock sizes according to the largest dimension of rock indicated in Table 5203/2.

TABLE 5203/2: ROCK SIZES ACCORDING TO THE LARGEST DIMENSION OF ROCK

Depth of Cage (m)	Rock size (mm)	
	Average Least Dimension (mm)	Maximum (mm)
0,2	125	150
0,3	125	200
0,5	125	250
1,0	125	250

M5204 ACCEPTANCE CRITERIA

Each finished gabion structure shall present a neat exposed face true to line and free from bulges in excess of 50 mm.

M5205 MEASUREMENT AND PAYMENT

Item		Unit
M520.01	Foundation trench excavation and backfilling	
(a)	In solid rock (material which requires blasting)	cubic metre (m^3)
(b)	In all other classes of material	cubic metre (m^3)

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.

Item		Unit
M520.02	Surface preparation for bedding the gabions	square metre (m^2)

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.

Item		Unit
M520.03	Gabions	
(a)	Gabion baskets (specify size of basket and mesh)	cubic metre (m^3)
(b)	PVC-coated gabion baskets (specify size of basket and mesh)	cubic metre (m^3)
(c)	Gabion mattresses (specify depth of mattress, mesh size and spacing of diaphragm)	cubic metre (m^3)
(d)	PVC-coated gabion mattresses (specify depth of mattress, mesh size and spacing of diaphragm)	cubic metre (m^3)

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, galvanising, PVC-coating, 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.

Item		Unit
M520.04	Geotextile (specify type and grade)	square metre (m^2)

The unit of measurement shall be the square metre of area covered with geotextile placed in position.

The tendered rate shall include full compensation for supplying the geotextile, cutting waste, placing, joining, overlapping and securing the material in position

SERIES M6000: VEGETATION MAINTENANCE

SECTION M6100: CONTROL OF VEGETATION GROWTH: MOWING AND CUTTING

CONTENTS

M6101 SCOPE

This section covers the control of planted or natural grasses and other 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.

The work shall either be executed on instruction or on a performance based basis as specified in the Project Specifications.

M6102 DEFINITIONS

The following definitions apply for the control of vegetation growth by mowing and cutting.

Mowing operation – mowing and cutting of vegetation by means of mechanical mowers or by handheld equipment, and disposal of vegetation cuttings. The mowing operation shall be undertaken on areas classified as general mow, shoulder mow, designated and additional.

General mow – a mow along the road, of all areas inside the road reserve including the road reserve of cross roads extending up to the limits of the Employer's responsibility, as indicated by reference marker boards or as shown on the drawings.

Shoulder mow – a mow along the road, of selected areas such as strips adjacent to the road surface, drains, culvert inlet and outlet areas, median, and designated areas, inside the road reserve including the road reserve of cross roads extending up to the limits of the Employer's responsibility, as indicated by reference marker boards or as shown on the drawings.

Designated areas – areas inside the road reserve such as the sight triangles at intersections, rest areas, lay byes, in front of and around road signs and reference marker boards, around traffic count stations and ITS infrastructure, along guardrails, and all other areas as specified or as shown on the drawings.

Additional areas – selected areas inside the road reserve which may require to be mowed more frequently than the programmed general mow, shoulder mow, and designated areas, such as ad hoc and rest areas, along fence lines, either side of concrete drains, and under guardrails.

Initial mow – an initial general or shoulder mow within the first two months of the contract period.

Interchange – the area of an interchange which has on and off ramps is defined as the full road reserve between the two furthest points of intersection of the outside edges of the ramp and the main carriageway, measured along the carriageway. This includes the full road reserve width of the cross road extending up to the limits of the Employer's responsibility, as indicated by reference marker boards or as shown on the drawings.

M6103 EXECUTION OF WORK

The frequency of the mowing operation as indicated in the Project Specifications shall be adhered to, or as instructed by the Engineer. An initial general or shoulder mow within the first two months of the contract period may be required and will be on the instruction of the Engineer.

(a) General mow

The area of mowing for a general mow shall be for the full road reserve area, irrespective whether it is a single carriageway, dual carriageway or single carriageway in a future dual carriageway road reserve including the road reserve of cross roads within the SANRAL road reserve.

(a) Shoulder mow

A shoulder mow along the road shall include the following:

(i) Strips adjacent to the road surface

The widths of the strips are:

4.5m measured from the edge of the road surfacing, where no adjacent concrete lined drain is present within a distance of 4.5m measured from the edge of the road surfacing to the inner edge of such a concrete lined drain. In the event that a concrete lined drain is present within 4.5m from the road edge as described above, the width of the strip will be to a distance 4.5m beyond the outer edge of the concrete lined drain including the portion between the road surfacing edge and the inner edge of the concrete lined drain.

(ii) Other hard surfaced areas including future pedestrian walk ways and gravel or grass side drains:

1.5m on both sides of the edge of all hard surfaces including future pedestrian walk ways outside of the strip described above in M6103 b(i), but within the Road Reserve.

(iii) Culvert inlet and outlet areas including the removal of all cuttings to avoid creating blockages.

The strip width must be at least the structure width or in the absence of headwalls, the horizontal opening of culvert plus 1m measured additional on both sides up to the road reserve boundary.

(iv) Median

The full width of the median on dual carriageway roads.

(v) Interchanges

Shoulder mowing at interchanges shall consist of the mowing of full interchange quadrants including the 3 m strips adjacent to the outside

edges of ramps as indicated on the drawings, and the cross road extending up to the limits of the Employer's responsibility.

(vi) Rest areas

The complete rest area outside the strip described above in M6103 b(i) up to the road reserve including 100m before the entrance and 100m beyond the exit of the rest area.

(vii) Designated areas

Shoulder mowing shall also include the cutting of all designated areas.

(c) Designated areas

The mowing of designated areas shall be for the full extent of the respective areas as specified or shown on the drawings.

The area along guardrails shall extend from the edge of surfacing or concrete side drain to 0,5 m behind guardrail posts.

(d) Additional areas

The mowing of additional areas shall be for the for the respective areas specified, namely ad hoc and rest areas, along fence lines, either side of concrete drains, and under guardrails.

(e) Mowing of strips adjacent to the fence line

Strips shall be mowed adjacent to the fence line to the following specified widths:

- In urban and peri-urban areas: 1 m wide
- In rural areas: 5 m wide

Such strips shall be mowed in urban and peri-urban areas in order to clear the fence of vegetation and in rural areas to serve as fire breaks or as an advance measure for the burning of fire breaks.

(f) Requirements

The following shall apply for any mowing operation:

(i) All declared vegetation (invasive and alien) and undesirable vegetation with a stem girth up to 150 mm, forms part of the mowing operation, and shall be removed and disposed of.

(ii) The grass shall be mowed to a height of not less than 50 mm and not more than 150 mm measured above the surrounding ground level, and the grass cuttings shall be removed and disposed of.

(iii) No distinction will be made between grass on flat areas or on slopes, or for grass in rocky areas.

(iv) The finished work shall provide a neat and even cut appearance with no isolated tufts of grass left remaining. Areas shall be left neat and tidy with all vegetation cuttings removed.

(v) 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.

(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 4 m from the edge of surfacing.

(vii) Vegetation shall be cut where it grows in joints and cracks, and spreads over the edges of all concrete, paved, stone pitched and other surfaced areas, and structures inter alia as follows:

- road pavement;
- drains of which concrete drains shall be swept clean of vegetation, silt and debris after the vegetation has been cut;
- lay-byes, sidewalks, traffic islands and ramp gores;
- embankment protection at bridges;
- bridges and culverts: and
- retaining and barrier structures.

Vegetation shall be cut at surfaced areas and structures in the following areas according to the mowing operation:

- general mow – full road reserve;
- shoulder mow, designated and additional areas – within and adjacent to the area of cut

(viii) The grass around any road signs which may be outside of the road reserve but are part of the signs layout for an interchange or intersection within the road reserve, shall be mowed.

(ix) Certain areas around road signs, trees, shrubs, hedges, dazzle screens, large obstructions, under guardrails, at retaining walls, barrier walls, wing walls and abutments, on steep slopes, in drainage trenches and dongas, and underneath fences, will not lend themselves to normal machine cutting and these areas shall be cut using alternative methods.

(x) Cutting by hand, cleaning and removal of grass cuttings shall keep up with the mechanical mowing. At no time shall the mechanical mower be allowed to be more than 7 km ahead of the hand team finishing behind.

(xi) Grass flattened by implements during the mowing operation shall be cut by hand.

(xii) Grass and other vegetation cuttings may not be burnt in the road reserve or in the immediate vicinity of any road.

(xiii) 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 shall replace all signs damaged due to veld fires at the Contractor's own cost.

(xiv) Any general or shoulder mow undertaken on instruction of the Engineer as a non-performance based item, which may include a portion thereof

which is separately undertaken as a shoulder mow or designated area as a performance based item, shall be carried out over its full area according to the specifications, irrespective if the vegetation within the area of the performance based item is within its own specification.

(xv) The breaking up and flattening of ant heaps.

(f) Non-performance based criteria

The general and shoulder mow, and mowing of designated and additional areas, shall be undertaken on instruction of the Engineer.

(g) Performance based criteria

The general mow, shoulder mow, and mowing of designated areas are as specified in the Project Specifications. An initial general mow or shoulder mow, for the respective area specified, shall be carried out within the first two months of the contract period, and the height of grass shall be kept within the specifications thereafter.

M6104 ACCEPTANCE CRITERIA

(i) Non-performance based criteria

Vegetation shall be cut to the required height and mowing done evenly without abrupt changes or breaks and within the period specified. The finished work shall provide a neat and even cut appearance with no isolated tufts of grass left remaining. Areas shall be left neat and tidy with all vegetation cuttings removed.

(ii) Performance based criteria

The height of the vegetation shall not be less than 50 mm and not more than 450 mm at any time.

Vegetation shall be cut to the required height and mowing done evenly without abrupt changes or breaks. The finished work shall provide a neat and even cut appearance with no isolated tufts of grass left remaining. Areas shall be left neat and tidy with all vegetation cuttings removed.

The acceptance criteria in terms of the height of grass, neatness and removal of vegetation cuttings, will be the same for the general and shoulder mow, and mowing of designated areas.

M6105 EQUIPMENT

Mechanical mowers shall only be used during initial mowing. The mechanical mowers shall be in good order and fitted with a boom mounted flail cutting attachment to cut vegetation on slopes. The mechanical mower and baler shall be fitted with two high intensity amber flashing lights, which shall be visible from both the front and the rear of the vehicle. In addition, the mechanical mower shall be fitted with structures designed to protect the operator from falling material or from being crushed should the vehicle overturn.

The hand team shall have equipment in good condition, including handheld machinery and implements for mowing and cutting of vegetation, and disposal of grass cuttings.

Safety precautions shall be taken to ensure that the mowing operation does not project or propel any stone or object, which may cause injury to persons, or damage to public vehicles and property.

Provision shall be made for one flagman to accompany each motorised mower. The flagman shall be thoroughly trained to carry out the flagging procedure required for the mowing activity to ensure that the travelling public respects any warnings given to 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 150 m behind the mower.

M6106 INSPECTION OF MOWING AND CUTTING FOR PAYMENT

(a) Non-performance based criteria

Inspection for mowing will be done as and when required after the completion of the work by the Contractor.

Failure by the Contractor to comply with the spacing requirements for the mechanical mower and hand team, and the completion time for the mowing operation specified in the Project Specifications shall render the Contractor liable for the penalty specified.

(b) Performance based criteria

Inspection for mowing will be based on the following:

- Inspection of mowing will be during the last 3 working days of every month.
- The different sections of the road shall be divided in 16 portions.
- 4 portions per section shall be inspected and the positions will be chosen randomly. (The same portions of road will apply for section M2400 and M2500).
- If the portion does not comply with the acceptance criteria that portion fails. See M6104.

The Contractor will be paid for the number of portions that pass inspection divided by 4 multiplied by the tendered rate per section.

Failure by the Contractor to meet the acceptance criteria shall render the Contractor liable for the penalty specified in Table C3.1.9/3 in Part C3 of the Project Specifications"

M6107 MEASUREMENT AND PAYMENT

M6100 GENERAL AND SHOULDER MOW

Item		Unit
M610.01	Initial general mow – non-performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges	lump sum (LS)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	lump sum (LS)

The unit of measurement shall be the lump sum for the initial general mow within the first two months of the contract period.

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing operation, regardless of whether the grass is cut by machine or hand, and shall include all costs for the picking up and disposal of grass cuttings.

Item		Unit
M610.02	Initial general mow – performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	lump sum (LS)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	lump sum (LS)

The unit of measurement shall be the lump sum for the initial general mow within the first two months of the contract period.

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing operation, regardless of whether the grass is cut by machine or hand, and shall include all costs for the picking up and disposal of grass cuttings.

Item		Unit
M610.03	General mow – non-performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	Number (No)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	Number (No)

The unit of measurement shall be the number of general mows carried out.

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing operation, and shall include all costs for the picking up and disposal of grass cuttings. and shall only be carried out by hand with brush cutters.

Item		Unit
M610.04	General mowing – performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	Number (No)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	Number (No)
	(c) 5km sections	month

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, and shall only be carried out by manual labour with brush cutters, and shall include all costs for the picking up and disposal of grass cuttings, all as specified in Clause .

The tendered rate item M610.04(c) shall be for 5km (or part of) general mow sections as ordered by the Engineer. When ordered by the Engineer, all 5km (or part of) sections on a route section shall be specified in the job instruction and shall be carried out monthly with the shoulder mow.

The tendered rate shall include full compensation for furnishing all equipment and labour for each mow and removal operation, including addition transport cost, regardless of whether the grass is cut by machine or hand, and shall include all costs for the picking up and disposal of grass cuttings, all as specified in Clause M6102.

Item		Unit
M610.05	Initial shoulder mow – non-performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	lump sum (LS)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	lump sum (LS)

The unit of measurement shall be the lump sum for the initial shoulder mow within the first two months of the contract period.

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing operation, regardless of whether the grass is cut by machine or hand, and shall include all costs for the picking up and disposal of grass cuttings.

Item		Unit
M610.06	Initial shoulder mow – performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	lump sum (LS)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	lump sum (LS)

The unit of measurement shall be the lump sum for the initial shoulder mow within the first two months of the contract period.

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing operation and shall include all costs for the picking up and disposal of grass cuttings, and shall only be carried out by hand with brush cutters.
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Item		Unit
M610.07	Shoulder mow – non-performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	Number (No)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	Number (No)

The unit of measurement shall be the number of shoulder mows carried out.

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing operation, and shall include all costs for the picking up and disposal of grass cuttings, and shall only be carried out by hand with brush cutters.

Item		Unit
M610.08	Shoulder mow – performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	Month
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	Month

The unit of measurement shall be the month for the shoulder mow, and is payable only after the initial shoulder mow has been completed to specification.

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing removal operation, and shall include all costs for the picking up and disposal of grass cuttings, and shall only be carried out by hand with brush cutters.

M6110 MOWING OF DESIGNATED AND ADDITIONAL AREAS

Item		Unit
M611.01	Mowing of designated areas – non-performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	Number (No)
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	Number (No)

The unit of measurement shall be the number of mows of designated areas carried out.

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing operation, and shall include all costs for the picking up and disposal of grass cuttings, and shall only be carried out by hand with brush cutters.

Item		Unit
M611.02	Mowing of designated areas – performance based	
(a)	Reserve with dual carriageway (specify section and km distance including interchanges)	Month
(b)	Reserve with single carriageway (specify section and km distance including interchanges)	Month

The unit of measurement shall be the month for the mow of designated areas carried out, and is payable only after the initial shoulder mow has been completed to specification.

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The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing operation, and shall include all costs for the picking up and disposal of grass cuttings, and shall only be carried out by hand with brush cutters.

Item		Unit
M611.03	Mowing of additional areas	
(a)	Ad hoc areas	square metre (m^2)
(b)	Rest areas	hectare (ha)
(c)	Fence line	
	(i) 1,0 m wide	kilometre (km)
	(ii) 5,0 m wide	kilometre (km)
(d)	1,0 m cut either side of Concrete drains and pedestrian paths not within the shoulder mow area as instructed by the engineer	kilometre (km)

The unit of measurement for subitems M611.03 (a) and (b) shall be the area cut.

The unit of measurement for subitems M611.03 (c) and (d) shall be the kilometre cut. For subitem M611.03 (d) the length shall be measured along the centre line of the concrete drain or pedestrian path. This exclude the cut as per M6103(a)(ii) and additional and only on instruction by the Engineer

The tendered rate shall include full compensation for furnishing all equipment and labour for the mowing and removal operation, and shall include all costs for the picking up and disposal of grass cuttings, and shall only be carried out by hand with brush cutters.

SERIES M6000: VEGETATION MAINTENANCE

SECTION M6200: CHEMICAL CONTROL OF UNDESIRABLE VEGETATION

CONTENTS

M6201 SCOPE

This section covers the chemical control of declared (invasive and alien) vegetation and eradication of undesirable vegetation through the application of herbicide.

The work shall be undertaken by registered specialist subcontractors with relevant experience.

M6202 EXECUTION OF WORK

The control of declared (invasive and alien) vegetation and eradication of undesired vegetation 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 Contractor is to assess the number of different types of chemicals that will be required to eradicate the areas of undesirable vegetation and control the vegetation growth, where application of chemicals will be required and to make provision accordingly for the fluctuating chemical demand per section of road.

The type of herbicide to be used, the correct spray rates, the method of application and time of application shall be in accordance with the manufacturer’s recommendations and instructions and shall be subject to prior approval by the Engineer.

(a) Control of vegetation growth

Subject to written approval by the Engineer beforehand, spraying shall be executed in the following designated areas and as shown on the drawings:

(i) Shoulder weed spray shall involve the spraying of a 300 mm wide strip of herbicide, 100 mm of which will be on the surfaced shoulder and 200 mm on the gravel shoulder.

(ii) Vegetation under guardrails shall be controlled by spraying under the guardrail to a minimum width of 500 mm.

(iii) Up to a minimum distance around the poles at distance marker boards, road signs and guardrail posts as indicated on the drawings.

(iv) Vegetation where it grows in joints and cracks of all concrete, paved, stone pitched and other surfaced areas, and structures inter alia as follows:
- road pavement;
- drains;
- lay-byes, sidewalks, traffic islands and ramp gores;
- embankment protection at bridges; and
- retaining and barrier structures.

(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.

Guidelines as to the herbicides to be used on the above areas are as follows:
- items (i), (ii) and (iii) - selective herbicide
- item (iv) - non-selective herbicide with three months residual
- item (v) - contact herbicide

(b) 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 re-growth.

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 herbicide to be used, the correct spray rates, the method of application and time of application shall be in accordance with the manufacturer's recommendations and instructions and shall be subject to prior approval 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.

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 in the opinion of the Engineer.

M6204 EQUIPMENT

Vegetation shall be eradicated using knapsacks or portable weed spray machines.

The equipment shall 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

Item		Unit
M620.01	Annual chemical eradication of undesirable vegetation	
(a)	Road reserve with dual carriageway (specify section and km distance including interchanges)	number (No)
(b)	Road reserve with single carriageway (specify section and km distance including interchanges)	number (No)
(c)	Chemical eradication of undesirable vegetation	Prov Sum (PS)
(d)	The Contractor's overhead charges and profit in respect of sub-item M620.01(c)	%

The unit of measurement shall be the number of annual chemical eradication of undesirable vegetation per section as specified, and described in sub-clause M6202 (b). A selective herbicide shall be used. The Contractor is to assess the number of different types of chemicals that will be required to eradicate the areas of undesirable vegetation.

The tendered rate shall include full compensation for all labour, equipment and chemical required for the spraying of the chemicals 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.

(a) The remaining 40% will be payable when at least 90% of the treated vegetation has been controlled in the opinion of the Engineer.

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for sub-item M620.01 (d) is a percentage of the amount actually spent under sub-item M620.01 (c), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M620.02	Additional chemical eradication of undesirable vegetation and control of vegetation growth on instruction of the Engineer	
(a)	Isolated areas	area (m^2)

(b)	Dense areas (areas more than 20% infested)	hectare (ha)
(c)	Shoulder weedspray	kilometre (km)
(d)	Extra over sub-item M620.02 (c) under guardrails	kilometre (km)
(e)	Between road reserve fence and neighbouring solid wall	area (m^2)
(f)	Around road signs, marker boards and traffic count stations	
	(i) Road reserve with dual carriageway (specify section and km distance including interchanges)	number (No)
	(ii) Road reserve with single carriageway (specify section and km distance including interchanges)	number (No)
(g)	Openings, cracks and joints on concrete channels, lay-byes and block paved areas, and joints between the road pavement and concrete channels	
	(ii) Road reserve with dual carriageway (specify section and km distance including interchanges)	number (No)
	(ii) Road reserve with single carriageway (specify section and km distance including interchanges)	number (No)

The unit of measurement for the items shall be as specified, for the additional chemical eradication of undesirable vegetation and control of vegetation growth on instruction of the Engineer, as described in sub-clause M6202 (a).

The herbicides to be used per sub-clause M6202 (a) are as follows:

items (i), (ii) and (iv)	- selective herbicide
items (iii), (vi) and (vii)	- non-selective herbicide with three months residual
item (v)	- contact herbicide

The Contractor is to assess the number of different types of chemicals that will be required to eradicate the areas of undesirable vegetation and control the vegetation growth.

The tendered rate shall include full compensation for all labour, equipment and chemical required for the spraying of the chemicals 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 in the opinion of the Engineer.

SERIES M6000: VEGETATION MAINTENANCE

SECTION M6300: REMOVAL OF UNDESIRABLE VEGETATION: PHYSICAL ERADICATION

CONTENTS

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.

"These are the plants which have been declared Weeds and Alien Invader Plants in South Africa in terms of the Regulations pertaining to the Conservation of Agricultural Resources Act 43 of 1983 as amended. For more information, about alien plants please see:
http://www.agis.agric.za/wip/
http://www.arc.agric.za/

Declared Weeds & Alien Invader Plants are divided into three categories:
Category 1 Plants. This is the strictest category. These plants may not occur on any land or inland water surface other than in a biological control reserve. Except for the purposes of establishing a biological control reserve, one may not plant, maintain, multiply or propagate such plants, import or sell or acquire propagating material of such plants except with the written exception of the executive officer.
Category 2 Plants. These are plants with a commercial application and may only be grown in demarcated areas (or biological control reserves). See the Government Gazette listed below for details relating to demarcated areas. Other provisions of category 1 apply.
http://www.plantzafrica.com/miscell/aliens1.htm
http://www.sana.co.za/alien-invasive-plants/"

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 bow saws.

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.

"The table below is not conclusive and only lists the most common for this area. For a more comprehensive list, the Conservation of Agricultural Resources Act may be downloaded from the Internet at the address:

http://www.nda.agric.za/docs/Act43/Eng.htm
http://www.environment.co.za/weeds-invaders-alien-vegetation/alien-invasive-plants-list-for-south-africa.html
http://www.invasives.org.za/invasive-species/itemlist/category/35-invasive-plants.html
http://www.sali.co.za/documents/CARA%20IAP%20lists%202002.pdf."

Species	Common Name	Category
Acacia Karroo	Sweet Thorn	-
Solanum mauritianum	Bugweed	1
Nicotiniana Glauca	Wild Tobacco	1
Opuntia (genus)	Prickly Pear species	1
Datura (genus)	Thorn apples	1
Ricinus communis	Castor oil plant	2
Agave sisalona	Sisal hemp	2
Asclepias fruticosa	Milkweed	2

All seed producing species or seed producing hybrids of Lantana that are non-indigenous to:

AfricaLantana/Lantana	Tickberry,CherryPie	1
Acacia implexa	Screw - pod wattle	1
Acacia longifolia	Long - leaved wattle	1
Melia azedarach	Syringa", Persian lilac	1b&3

Vegetation growing within 200 mm 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 50 mm - 100 mm 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 instructed 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 500 mm 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 into manageable sections for loading and transporting to spoil areas.

(c) Fire breaks

Median and fence line firebreaks shall be burned at the end of the growing season after the shoulder / general mow. The firebreaks shall be 5 m wide. Median firebreaks shall be placed at approximately 200 m intervals. Fence line firebreaks shall be a continuous 5 m wide strip adjacent to the fence where required. The burning of a fence line firebreak shall only be done in areas identified by the Engineer and on direct instruction from the Engineer.

Generally, the burning of median and fence line firebreaks shall be undertaken when the grass in the median is dry and less than 150 mm 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 fence line 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 the fence and road shall be only undertaken on instruction from the Engineer. These firebreaks will consist of a 5 m wide mow adjacent to the fence line. 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 fence line.

The Contractor shall indemnify the Employer against all proceedings, claims, actions, damages and costs which may arise from or be related to the 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 Veld and Forest Fire Act, 1998 (Act No 101 of 1998).

All work executed in assisting the landowners with burning firebreaks as required by the Veld and Forest Fire Act, 1998 (Act No 101 of 1998), is to be instructed by the Engineer and will be paid for under Dayworks.

Before commencement of the burning of fire breaks, the Contractor shall submit a method statement for approval by the Engineer, stating the procedure to be followed during the burning process.

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

Item		Unit
M630.01	Eradication of undesired vegetation	
	(a) Initial Eradication	
	(i) Undesirable vegetation and trees with a girth of 0 to 150 mm (specify section and km distance including interchanges)	lump sum (LS)
	(ii) Trees with a girth exceeding 151 mm to 500 mm (specify section and km distance including interchanges)	lump sum (LS)
	(b) Annual Eradication (specify section and km distance including interchanges)	number (No)

The unit of measurement for sub-items M630.01 (a) (i) and (ii) is a lump sum, for the initial eradication of undesirable vegetation and felling of declared trees as described in sub-clause M6302 (a), on the instruction of the Engineer. The felling of declared trees described in sub-clause M6302 (a) with a girth greater than 500 mm will be measured and paid for under item M630.02.

The unit of measurement for sub-items M630.01 (b) is a number for the annual eradication of undesirable vegetation and felling of declared trees

The tendered rates shall include full compensation for all labour and equipment necessary for the cutting of the vegetation, 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.

Item		Unit
M630.02	Tree felling on instruction from the engineer	
(a)	Girth exceeding 150 mm up to 500 mm	number (No)
(b)	Girth exceeding 500 mm up to 1 000 mm	number (No)
(c)	Girth exceeding 1 000 mm up to 2 000 mm	number (No)
(d)	Girth exceeding 2 000 mm up to 4 000 mm	number (No)
(e)	Girth exceeding 4 000 mm	number (No)

The unit of measurement shall be the number of trees felled. Distinction shall be made for the girth of the tree felled measured at 1,0 m above ground.

The girth of trees shall be measured as follows:

(i) Trees with a single trunk within 1 m of ground level

Measured at the narrowest point of the trunk in the first metre of its height above ground level.

(ii) Trees with a junction within 1 metre of its height above ground level, emerging into one or more branches

Each branch shall be measured separately at the narrowest point of the branch between the junction and the first metre of its height above ground level."

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 and transporting the material to a dumpsite.

Item		Unit
M630.03	Burning of fire breaks per operation	
(a)	5 m wide fire breaks in median (specify section and km distance including interchanges)	number (No)
(b)	5 m wide fire breaks from road reserve fence to road reserve fence (excluding median fire breaks) (specify section and km distance including interchanges)	number (No)
(c)	5 m wide fire breaks next to road reserve fence	kilometre (km)

The unit of measurement shall for subitem M630.04 (a) and (b) be the number of fire break operations.

The unit of measurement for subitem M630.04 (c) shall be the kilometre of fire break operation.

The tendered rate shall include full compensation for all equipment, transport and labour required to burn the fire breaks, including protective measures against fire damage to established shrubs and hedges and for providing and erecting fire warning signs on both carriageways.

Item		Unit
M630.04	Additional eradication of undesired vegetation as instructed 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, 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

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 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 shall also include the loosening of soil, the forming of ponds around young plants 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 mixed 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 plants.

(ii) Hedge plants shall be planted 1,5 m apart or as directed by the Engineer and shall include the replacement of dead, damaged or missing plants.

(iii) When the carriageways are at different levels, the hedge plants shall be planted 2 m 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) above.

(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 10 m from the edge of surfacing.

(x) Shrubs shall not be planted closer than 7 m from the edge of surfacing, unless otherwise instructed by the Engineer.

(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 500 mm square by 600 mm deep and spaced 1,5 m apart for hedge plants.

(ii) Holes for trees shall be at least 600 mm square by 700 mm 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 200 mℓ per shrub hole and 500 mℓ per tree hole.

(iv) The holes shall be thoroughly watered before plants are planted. Where the soil is poorly drained, 150 mm 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 roots shall be loosened slightly from the soil 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 150 mm 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 35 mm and its maximum length shall be 1,5 m 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 or on instruction of the Engineer.

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 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 instructed by the Engineer. 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.

(k) Pruning of trees

Pruning of trees shall be executed on those trees causing obstructions or causing safety problems. Only those trees as indicated by the Engineer on site shall be pruned and branches removed.

Branches shall be pruned within various heights and measured from the ground as indicated by the Engineer.

Where required cut faces shall be painted with sealant to prevent re-growth. The branches shall be cut into manageable sections for loading and transporting to spoil areas.

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

Item		Unit
M640.01	Hoeing around trees, shrubs and hedges	
(a)	Trees, shrubs and hedges up to 20 m apart	number (No)
(b)	Trees, shrubs and hedges exceeding 20 m up to 100 m apart	number (No)
(c)	Trees, shrubs and hedges exceeding 100 m apart	number (No)

The unit of measurement shall be the number of trees, shrubs and hedges around which are hoed. Distinction shall be made the tree, shrub and hedge spacing.

The tendered rate shall include full compensation for the equipment and labour required to hoe around the trees, shrubs and hedges. The tendered rate shall also include the removal of all cuttings arising from this operation to an approved dumping site.

Item		Unit
M640.02	Trimming of shrubs and hedges	
(a)	Annual trimming of shrubs and hedges	
	(i) Reserve with dual carriageway (specify section and km distance including interchanges)	number (No)
	(ii) Reserve with single carriageway (specify section and km distance including interchanges)	number (No)

The unit of measurement shall be the number of trimming of shrubs and hedges carried out.

The tendered rate shall include full compensation for the equipment and labour required for trimming shrubs and hedges to the specified size. It also includes the removal and haul of all cuttings arising from the operation to an approved dumpsite.

Item		Unit
M640.03	Preparing plant holes	
(a)	Trees	number (No)
(b)	Shrubs and hedge plants	number (No)

The unit of measurement shall be the number of holes prepared as prescribed.

The tendered rate shall include full compensation for all equipment, labour and tools required for excavating the hole, backfilling the hole with topsoil, and furnishing and mixing in manure or compost and the specified fertiliser, for watering the hole prior to planting and for disposing of the excavated material. It shall include for furnishing and placing crushed stone in the bottom of the hole as prescribed.

Item		Unit
M640.04	Supply of trees, shrubs and hedge plants	
(a)	Supply of trees, shrubs and hedge plants	provisional sum (Prov Sum)
(b)	The Contractor's overhead charges and profit in respect of sub-item M640.04 (a)	percentage (%)

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for sub-item M640.04 (b) is a percentage of the amount actually spent under sub-item M640.04 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M640.05	Watering of trees, shrubs, hedge plants and grass	kilolitre (kℓ)

The unit of measurement shall be the kilolitre of water used.

The tendered rate shall include full compensation for obtaining, transporting and applying the water.

Trees, shrubs, hedge plants 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 and shall submit such information to the Engineer on a daily basis.

SERIES M6000: VEGETATION MAINTENANCE

SECTION M6500: ESTABLISHMENT OF GRASS

CONTENTS

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 or soil-improvement material to be used shall be one or more of the following types and any other type of fertiliser or 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 shall 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 30 mm deep, and sods taken from the veld in moist soil not less than 50 mm

deep. Sods shall also measure a minimum of 400 mm in width and 500 mm 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 30 mm 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 shall be mowed regularly and cared for to provide suitable sods to the satisfaction of the Engineer. The top 50 mm 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 400 mm from 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 the sources.

Topsoil shall be stockpiled in separate loose heaps as tipped from the trucks and shall be stockpiled in heaps not exceeding 2,0 m 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, be old, sweated and pure kraal manure free from soil, weed seeds or other undesirable material. It shall not contain any particles that will not pass through a 50 mm 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 50 mm screen and shall be approved by the Engineer before being delivered to the site.

(h) Anti-erosion compound

Anti-erosion compounds may be required and will be applied on instruction of 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 50 mm 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 30 mm below the top of adjacent kerbing, channelling or pavement for nursery sods and 50 mm 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 100 mm 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 30 mm in size on areas to be mowed by machine and falling within the road reserve and all stones exceeding 150 mm 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 150 mm.

Where soil is too hard to be ploughed with a light tractor, the soil shall be ripped up to a depth of 300 mm before it is loosened by ploughing to a depth of 150 mm.

(iii) Fertilising

For all areas to be re-vegetated the Contractor shall, without any additional compensation, have the top 150 mm 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 150 mm either mechanically or manually. Where hydroseeding 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 hydroseeding.

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 150 mm.

(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 50 mm 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 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 75 mm 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 300 mm long by 20 mm in thickness knocked in to a depth of 100 mm. 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) Hydroseeding 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.

Hydroseeding shall be carried out with an approved hydroseeding machine at a rate of application of not less than 38 kg 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 600 kg/ha and 1200 kg/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 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 hydroseeded shall be covered with grass and that no bare patches exceeding 0,25 m^2 in any area of 1,0 m x 1,0 m 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-hydroseeding where no acceptable cover has been established.

This responsibility shall 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

Item		Unit
M650.01	Trimming for grassing	
(a)	Machine trimming	square metre (m^2)
(b)	Hand trimming	square metre (m^2)

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.

Item		Unit
M650.02	Loosening of topsoil	
(a)	Ripping	hectare (ha)
(b)	Ploughing for loosening topsoil	hectare (ha)

The unit of measurement shall be the hectare of topsoil loosed.

The tendered rate for subitem M650.02 (a) shall include full compensation for ripping the topsoil, complete as specified.

The tendered rate for subitem M650.02 (b) shall include full compensation for loosening the topsoil by ploughing, removing stones, levelling and trimming the surface.

Item		Unit
M650.03	Topsoil placing	
(a)	Flat areas	cubic metre (m^3)
(b)	Slopes	cubic metre (m^3)

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.

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 1,0 km, as well as for all hand tools and supervision to complete the work.

Item		Unit
M650.04	Overhaul on material hauled in excess of 1,0 km	cubic metre kilometre (m^3.km)

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

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

Item		Unit
M650.05	Chemical fertiliser and/or soil improvement material for grassing (type 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.

Item		Unit
M650.06	Removal of existing vegetation from slopes before sodding	square metre (m^2)

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.

Item			Unit
M650.07	Grassing		
(a)	Grass runners (type of grass indicated)		square metre (m^2)
(b)	Sodding		
	(i)	Nursery sods (type indicated)	square metre (m^2)
	(ii)	Veld sods	square metre (m^2)
(c)	Hydroseeding and hand sowing		
	(i)	Providing an approved seed mixture for hydroseeding or hand sowing	kilogram (kg)
	(ii)	Hydroseeding	hectare (ha)
	(iii)	Hand sowing(Labor –intensive)	square metre (m^2)

The unit of measurement for subitem M650.07 (a) for planting grass runners shall be the square metre of established grass with an acceptable grass cover.

The tendered rate for planting grass runners 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.

The unit of measurement for subitems M650.07 (b)(i) and (ii) for sodding shall be the square metre covered with sods, which has an acceptable cover.

The tendered rate sodding 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 grass sods obtained from within the road reserve or borrow areas. In the case of grass sods the tendered price shall include levelling-off and trimming areas from which the sods are taken.

The unit of measurement for subitem M650.07 (c)(i) 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 for providing seed shall include full compensation for procuring and furnishing the seeds.

The unit of measurement for subitem M650.07 (c)(ii) for hydroseeding shall be the hectare of grass established by hydroseeding, which has an acceptable cover.

The tendered rate for hydroseeding 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-hydroseeding bare patches, and for any other work, except mowing, which may be necessary for establishing an acceptable cover and maintaining the grass.

The unit of measurement for subitem M650.07 (c) (iii) for hand sowing grass seeds shall be the square metre of grass with an acceptable covering on surfaces instructed by the Engineer to be hand sown.

The tendered rate for hand sowing grass seeds 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

This section covers the provision by the Contractor of standby teams to provide emergency assistance for the normalisation of emergency events and emergency earthworks 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 assistance service shall be provided by an emergency standby team consisting of the emergency standby vehicle, equipment and personnel.

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.

(i) Emergency standby vehicle and trailers

The emergency standby team shall at least consist of a light delivery vehicle (LDV) with a minimum loading capacity of 1 ton with pushbars, cage-work and ramp and trailer as well as a fire fighting trailer (1000 litre capacity).

The emergency standby trailer which is equipped with the 3,2 m by 2,5 m wide electronically illuminated high visibility sign shall be fully rigged with the necessary electrical power source and equipment to illuminate flashing lights fitted at 300 mm centres on the perimeters of the TR103 sign and TW336 warning signs and on the perimeter of the 3,2 m by 2,5 m panel. Trailers shall be in good condition.

(ii) Emergency standby equipment

As a minimum the following tools and equipment in good condition, shall be available, at any time, with each emergency standby team for emergency assistance:

TABLE M7102/1: EMERGENCY STANDBY EQUIPMENT	
Equipment Requirements Per Team	
Item	**Quantity**
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 prodder	1
Chainsaw (including all fuel, oils and safety equipment)	1
Bowsaw	1
Axes	2
Bush knives (two with long handles)	4
Block and tackle (minimum strength of 1,5 ton)	1
Metal chain 8 mm	10 m
Rope (heavy duty)	2 x 30 m
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	5 x 25kg
150 mm angle grinder	1
Orange medical box	1
5 kVA generator with 2 x 500 W floodlights	1
Emergency roadsigns, barricades, cones etc	According to drawing
Protective day-glow clothing (reflective jackets and rain suits)	For all personnel
~~Fire fighting trailer (1 000 litre capacity)~~	~~1~~
TOOLS:	
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
SUNDRIES:	
Bucket (and cloths)	2
Squeegee (with extendable handle)	2
Water containers (20 litres)	2
Gloves (heavy duty)	9 pairs

All of the abovementioned equipment should be neatly packed into the emergency standby trailer used specifically for the rendering of emergency assistance.

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 daywork.

(iii) Emergency standby personnel

The emergency standby team shall at least consist of a supervisor and eight labourers. The supervisor's management and skill level shall 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 shall 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.

(c) 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 specified time, as indicated in the Project Specifications, on the receipt of the instruction. The Contractor shall take this requirement into account when deciding on the site of the Contractor's labourers' 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.

(d) Communication

The Contractor shall ensure that communication between the Engineer's representative and the Contractor's representative is maintained 24 hours a day. This can be attained by means of the provision of dedicated 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 shall 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.

Item			Unit
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. The tendered rate shall include full compensation for providing the vehicle, and maintaining the trailer and equipment required for the emergency standby team. The rate shall also include the costs for any damages, repairs and replacement of the vehicle, trailer and equipment required.

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

This section covers the work involved in the normalisation, restoration, and safeguarding of dangerous areas, and clearing of spillages 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, or clear spillages in order for the safe passage of any traffic using the road.

The scene of any accidental event shall be cleared of all debris and spillages, which Shall be disposed of to an approved dumpsite. It may be necessary for temporary warning signage to be erected to warn road users of any temporary or unsafe condition of the road.

In the event of an accident, any vehicle/s involved in the accident shall not be removed without prior permission from the Engineer or police. In addition, before the Contractor moves 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 be disposed of to an approved dumpsite. 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, and any spillage cleared, to ensure a safe passage for any traffic using the road.

M7204 MEASUREMENT AND PAYMENT

Item		Unit
M720.01	All-emergency normalisation	
(a)	Accident restoration and clearing of spillages	hour (h)
(b)	Sheltering of animals	hour (h)
(c)	Fire fighting	hour (h)
(d)	Safeguarding of dangerous area	hour (h)

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.

Item		Unit
M720.02	Procurement of materials	
(a)	Procurement of materials	provisional sum (Prov Sum)
(b)	The Contractor's overhead charges and profit in respect of sub-item M720.02 (a)	percentage (%)

The unit of measure for sub-item M720.02 (a) shall be the amounts actually paid for the procurement of materials for all-emergency normalisation on instruction of the Engineer. In addition, the type of cleaning material to be used shall be approved by the Engineer prior to the procurement thereof.

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for sub-item M720.02 (b) is a percentage of the amount actually spent under sub-item M720.02 (a), which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M8000: STRUCTURE REPAIR

SECTION M8100: MINOR REPAIRS TO STRUCTURES

CONTENTS

M8101 SCOPE

This section covers the work in connection with the minor repairs to structures. The repair work is regarded as specialised work and shall be undertaken by specialist 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 subitem M810.01 (a).

M8104 MEASUREMENT AND PAYMENT

Item		Unit
M810.01	Minor repairs to structures	
(a)	Minor repairs to structures	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M810.01 (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 subitem M810.01 (a) which shall include full compensation for the overhead charges and profit of the Contractor.

SERIES M9000: DAYWORKS

SECTION M9100: DAYWORKS SCHEDULE

CONTENTS

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 Bill 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 Bill of Quantities.

M9102 ORDERING OF DAYWORK

No daywork shall be undertaken unless written authorisation has been obtained from the Engineer.

M9103 WORK RESERVED FOR DAYWORK

The following specific types of work regarding road maintenance are reserved for inclusion under daywork and for payment under the relevant items in the daywork 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 portable protection 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-byes

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: Accommodation of Traffic.

The following daywork items are applicable to daywork.

Item		Unit
M910.01	Labour during normal working hours	
(a)	Unskilled	hour (h)
(b)	Semi-skilled	hour (h)
(c)	Skilled	hour (h)
(d)	Team Leader (Ganger)	hour (h)
(e)	Flagman	hour (h)

Item			Unit
M910.02	Labour outside normal work hours		
(a)	Outside normal working hours and Saturdays		
	(i)	Unskilled	hour (h)
	(ii)	Semi-skilled	hour (h)
	(iii)	Skilled	hour (h)
	(iv)	Team Leader (Ganger)	hour (h)
	(v)	Flagman	hour (h)
(b)	Sundays and public holidays		
	(i)	Unskilled	hour (h)
	(ii)	Semi-skilled	hour (h)
	(iii)	Skilled	hour (h)
	(iv)	Team Leader (Ganger)	hour (h)
	(v)	Flagman	hour (h)

The unit of measurement for items M910.01 and M910.02 shall be the number of hours of work executed, and excludes travelling time to and from the site.

The tendered rate shall include full compensation for the provision of labour, transport of personnel to and from site, site supervision, use of small hand tools and appliances, non-mechanical equipment and consumable stores.

Prior to the commencement of any work by the labourers described under items M910.01 and M910.02, the Contractor shall obtain agreement from the Engineer regarding the classification of all labourers in terms of "unskilled", "semi-skilled" and "skilled" labourers.

Item			Unit
M910.03	Equipment and transport		
(a)	Tipper Trucks		
	(i)	3 to 5 ton capacity	hour (h)
	(ii)	More than 5 ton capacity	hour (h)
(b)	Loader (0,5 m3) bucket		hour (h)
(c)	Grader (CAT 140G or similar)		hour (h)
(d)	Compactor (Bomag BW 90 or similar)		hour (h)
(e)	Water truck (5 000 l)		hour (h)
(f)	Mechanical broom		hour (h)
(g)	Tractor-trailer combination (43 kW, 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 (6.5 KVa)		hour (h)
(s)	TLB		hour (h)
(t)	Bobcat		hour (h)

(u)	Excavator (2 – 6 ton pneumatic tyres)	hour (h)
(v)	Excavator (18 – 22 ton tracked)	hour (h)
(w)	Sky-jack 5 m	hour (h)
(x)	Establishment of loader (bucket 0,5m^3) to site	Number (No)
(y)	Establishment of Grader (CAT 140 G or similar)	Number (No)
(z)	Establishment of Excavator (18 – 22 ton tracked)	Number (No)

The unit of measurement shall be as the unit specified for the item of equipment. Non-working hours for transport breakdown, lack of driver or operator, or any other reason shall not be measured.

The unit of measurement for subitems M910.03 (x), (y) and (z) shall be the number of times the equipment is established on site. Establishment shall be measured once for the same operation.

The tendered rate shall include full compensation for providing the equipment and cost of operation, and shall be an all-inclusive hire charge for the use of the equipment and driver or operator. The tendered rate shall include the transport of equipment to and from site, except for subitems M910.03 (x), (y) and (z) where separate provision is made therefor.

Measurement shall only be for work instructed and directed by the Engineer, where the Engineer considers no other appropriate rate is available in the Bill of Quantities.

Item		Unit
M910.04	Procurement of materials	
(a)	Procurement of materials	provisional sum (PS)
(b)	Overhead charges and profit in respect of subitem M910.04 (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 subitem M910.04 (a) which shall include full compensation for the overhead charges and profit of the Contractor.

Item			Unit
M910.05	Extra over item M910.03 for establishment, within 24 hours of		
(a)	Tipper Trucks		Number (No)
	(i)	3 to 5 ton capacity	Number (No)
	(ii)	More than 5 ton capacity	Number (No)
(b)	Dewatering pump including generators and accessories (specify size)		Number (No)
(c)	Water truck (5 000 l)		Number (No)

(d)	TLB	Number (No)
(e)	Bobcat	Number (No)

Item		Unit
M910.06	Repairs to road network	
(a)	Repairs to road network	provisional sum (PS)
(b)	The Contractor's overhead charges and profit in respect of subitem M910.06 (a)	percentage (%)

This pay item is for the emergency or specialist repairs to the road network which is required by the Employer, and which work will be undertaken by a nominated subcontractor, and will be for work in excess of R100,000.00 per service. Arrangements for the services required and supervision thereof, will be undertaken by the Engineer. The contractor will only be required to make arrangements for the payment of the services required.

The unit of measure for sub-item M910.06 (a) shall be the amounts actually paid for the procurement of the services required for the repairs to the road network on instruction of the Engineer.

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for sub-item M910.06 (b) on the amount actually spent under sub-item M910.06 (a) may not exceed 5%, which is full compensation for the overhead charges and profit of the Contractor.

Item		Unit
M910.07	Minor road infrastructure	
(a)	Minor Infrastructure	provisional sum (PS)
(b)	The Contractor's overhead charges and profit in respect of subitem M910.07 (a)	percentage (%)

This pay item is for the construction of minor road infrastructure such as walkways, sidewalks and lay-byes.

Measurement and payment shall be in accordance with the provisions of sub-clause 13.5 of the FIDIC Conditions of Contract for Construction, 1999. The tendered percentage for sub-item M910.07 (b) is a percentage of the amount actually spent under sub-item M910.07 (a), which shall include full compensation for the overhead charges and profit of the Contractor.