

**MOKOLO AND CROCODILE  
WATER AUGMENTATION PROJECT  
PHASE 2 (MCWAP-2)**

**TENDER NO 054/2024/PMID/MCWAP2/RFB**

**PART C3.1  
SPECIFICATION**

**SECTION 26**

**ROAD MAINTENANCE**

## PART C3.1 SPECIFICATION

### SECTION 26 ROAD MAINTENANCE

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**SECTION 26****MAINTENANCE OF ROADS****26.1 SCOPE****26.1.1 General**

This Section deals with the blading, re-gravelling of gravel roads and patching of surfaced roads in the vicinity of the pipeline route, as well as the reinstatement of existing roads where the pipeline crosses the road by means of trench excavation.

The Contractor will be required to undertake periodic maintenance of existing public roads that are being trafficked by construction vehicles. These maintenance operations, such as watering, grading and re-graveling, will be instructed by the Engineer on an ad hoc basis.

**26.1.2 References**

When reference is made to a Code of Practice, Specification or Standard, the reference shall be taken to mean the latest edition or replacement at time of tender of the Code, Specification or Standard; including addenda, supplements, modifications and revisions thereto. Where a previous version is intentionally used, it will be indicated as such. Where reference is made to a Code, Specification or Standard that has subsequently been withdrawn and not replaced, the intended content will remain relevant unless confirmed otherwise in writing by the Engineer.

**26.1.3 Description of the Site**

All the gravel roads in the vicinity of the pipeline route are included and shall be bladed, re-gravelled or reconstructed as is required to provide reasonable access as what may be expected from a tertiary gravel road, serving mainly the farming community in the area.

In the case of surfaced roads, only a nominal quantity of work has been allowed for patching using asphalt base and surfacing. This will only be implemented from time to time as ordered by the Engineer. The purpose of this patching is only to improve riding quality of frequently used roads and will be adjusted to suite budget constraints. All sites where the pipeline crosses the road with an excavation are included in this Section. Furthermore some temporary road signs may be required where pipe jacking takes place. These signs are also specified and measured in this Section.

**26.1.4 Detailed Description of Work**

- a) Cleaning of existing stormwater pipes/culverts and the provision of head and wing walls where required;
- b) The installation of additional stormwater pipes including head and wing walls;
- c) The relaying and/or replacement of existing stormwater pipes;
- d) Normal and dry blading of the road where indicated by the Engineer;
- e) Reshaping and compaction where required. This will entail the cleaning of the formation of all vegetation there after the area will be ripped, shaped, trimmed, watered and compacted to the specified cross-section and cambers. This procedure will also include cutting materials from the sides to the crown and the shaping of the drains;

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- f) Provision of 150 mm - 200 mm thick wearing course where required;
  - g) Construction of temporary gravel deviations including the erecting of necessary temporary signboards to manage existing traffic safely past the areas where the pipe crosses certain roads;
  - h) The treatment of these bypasses when construction of the pipeline and reinstatement of the existing road has been completed;
  - i) The reinstatement of the existing road above the normal backfill to the pipeline in two layers of 150 mm each. These layers may consist of Asphalt base, Emulsion treated crushed stone base, cement stabilized crushed stone base, G6 gravel, G7 gravel, or gravel wearing course as indicated on the Drawings; and
  - j) The reinstatement of power lines and finishing of road and road reserve after completion of all construction.

### 26.1.5 Accommodation of Traffic

The following methods will be used to accommodate the traffic:

- Blading/Reshaping - Restricted two-way traffic;
- Re-gravelling - half width – stop/go arrangement;
- Culvert installation - half width – stop/go arrangement;
- Patching on major roads - half width – stop/go arrangement; and
- Road Crossing (pipeline) - full width - deviation (gravel).

The sign sequence of all the above have been included in the Tender Drawings.

### 26.1.6 Structures

A list with the approximate kilometre distances of existing and proposed new culverts is included in this Section. New head and wing walls will be constructed at the existing as well as at the proposed new pipe culverts.

Although the proposed new pipe culverts are included in the project they will only be provided on the written instruction of the Engineer and at the positions indicated by the Engineer.

Some of the existing pipe culverts must be re-laid for one of the following reasons:

- Shall be laid at skew; or
- To lower invert level.

This work will also be executed only on the written instruction of the Engineer.

As the majority of the existing pipe culverts are blocked (due to silting) they will in all likelihood be cleaned.

### **26.1.7 Maintenance of Works**

The Contractor will be responsible for the maintenance of the Works during construction of the pipeline. The safety of the public traffic shall receive the highest priority at all times.

This maintenance will mainly include blading of existing gravel roads and will be ordered by the Engineer from time to time.

The Contractor will be required to maintain gravel bypasses including watering if required.

### **26.1.8 Borrow Pits**

Borrow pits and spoil areas have been identified by the Employer and are shown on the Drawings provided in Volume 3, Part C4.2 - Geotechnical Data.

### **26.1.9 Drawings**

The reduced Drawings that are included with other Tender Drawings shall be used for Tender purposes only.

Only figured dimensions shall be used and Drawings shall not be scaled unless so instructed by the Engineer. The Engineer will supply dimensions that may have been omitted from the Drawings.

### **26.1.10 Construction in Confined Areas**

It may be necessary for the Contractor to work in confined areas. The method of construction in these confined areas depends on the Contractor's constructional equipment. However, the Contractor must note that measurement and payment will be in accordance with the specified cross-sections and dimensions, irrespective of the methods used to achieve these cross-sections and dimensions, and that the rates and amounts tendered will be deemed to include full compensation for any special equipment or construction methods or for any difficulty encountered in working in confined areas and narrow widths, and at or around obstructions, and that no extra payment will be made nor will any claim for payment be considered on account of these difficulties.

## **26.2 DEFINITIONS**

- a) **“Pavement layer”** or **“Layer work”** means the upper layers of the road comprising the selected layers, sub-base, gravel wearing course and shoulders.
- b) **“Shoulder”** means:
  - When shoulder is referred to as a surface - the area between the outside edge of the travelled way and the shoulder breakpoint.
  - When shoulder is referred to as a pavement - the layer on top of the sub base and lying between the outside edge of the base or, as applicable, wearing course and the shoulder breakpoint.
- c) **“Shoulder breakpoint”** means the line along which the extended flat planes of the surface of the shoulder and the outside slope of the fill and pavement intersect. This edge is normally rounded to a predetermined radius.

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- d) **“Sub base”** means the layer of material of specified dimensions on top of the selected fill and below the base and shoulders.
- e) **“Wearing course”** means a layer of material of defined thickness and width constructed on top of the selected layer in the case of an unsurfaced road.
- f) **“Base”** means a layer of material of defined thickness and width constructed on top of the sub base, or in the absence thereof, the selected layer. A base may extend to outside the travelled way.
- g) **“Grading Coefficient (Gc)”** means the product of the percentage by mass, of the total sample, retained between the 26.5 mm and 2 mm sieves plus the percentage by mass, of the total sample, passing the 4.75 mm sieve, divided by 100.
- h) **“Oversize Index (Io)”** means the mass of material retained on a sieve of size equal to the nominal maximum specified size for the aggregate, as a percentage of the total mass of the material.
- i) **“Shrinkage product (Sp)”** means the product of the linear shrinkage and the percentage by mass of the total sample passing the 0.425 mm sieve.
- j) **“TRH 20”** shall mean a manual published by the SDIR: The Structural Design, Construction and maintenance of un-paved roads, 1990.

## 26.3 MATERIALS

### 26.3.1 Fill

Where fills are constructed the material will have a minimum CBR of 3% at 90% of modified AASHTO density and a maximum PI of 15.

All fills are shall be compacted to a minimum density of 93% modified AASHTO density.

### 26.3.2 Layer Works

#### 26.3.2.1 General

Layer work material shall be obtained only from approved borrow areas or such other sources of supply as may be specified or approved for use from time to time. Only soil, gravel, aggregate or other approved material shall be used for the construction of layer Works.

#### 26.3.2.2 Selected Layer

Selected layer material shall, unless otherwise instructed by the Engineer, conform to the requirements given in Table 25/1 of Section 25 – Roadworks and Paving, when finally placed.

#### 26.3.2.3 Gravel Wearing Course

The gravel wearing course material shall, unless otherwise instructed by the Engineer conform to the requirements given in Table 25/3 of Section 25 – Roadworks and Paving, when finally placed.

### **26.3.3 Materials for Patching**

#### **26.3.3.1 Bituminous Binders**

The various bituminous binders specified shall comply with the relevant SABS specifications stated below:

Road-grade bitumens	SANS 307
Bitumen emulsions	SANS 4001_BT3:2014 (anionic) SANS 548 (cationic)

### **26.3.4 Earthworks and Layer Works**

#### **26.3.4.1 Scope**

This Section covers the blading of gravel roads by self-propelled motor grader to improve the rideability, correct drainage faults as well as to shape, trim and compact the formation to the required cross-sections and cambers.

It also covers the reconstruction of existing gravel roads and construction of new gravel wearing course on existing roads.

#### **26.3.4.2 Clearing**

Clearing shall consist of the removal of all trees, bush, other vegetation, rubbish and all other objectionable material, including the disposal of all material resulting from the clearing and grubbing.

No payment will be made for the moving of soil or gravel material which may be inherent in or unavoidable during the process of clearing. Clearing shall also include the removal of all rocks and boulders of up to 0.15 m<sup>3</sup> in size which are exposed or lying on the surface.

#### **26.3.4.3 Grubbing**

In the roadway all stumps and roots exceeding 75 mm in diameter shall be removed to a depth of no less than 600 mm below the finished road level and a minimum of 75 mm below the original ground level. Where the roadbed is to be compacted, all stumps and roots, including matted roots, shall be removed to a depth of at least 200 mm below the cleared surface.

Except at borrow areas, the cavities resulting from the grubbing shall be backfilled with approved material and compacted to a density of at least the density of the surrounding ground.

#### **26.3.4.4 Treating the Roadbed**

Treatment of the roadbed will be required for the reconstruction of existing roads or construction of new roads.

**(a) Removing Unsuitable Material**

Any roadbed material considered by the Engineer to be of a quality that would be detrimental to the performance of the completed road shall be removed to such widths and depths as may be instructed by the Engineer and shall be disposed of as prescribed. The excavated spaces shall then be backfilled with approved imported material compacted to the required density.

The Engineer may also instruct that material which is too wet to provide a stable platform for the construction of the fill or gravel layers be removed and replaced with suitable dry material which may include a pioneer layer as specified.

**(b) Roadbed Compaction**

Any part of the roadbed which is classified as being suitable for use in situ, shall be scarified, watered and compacted to 90% of Modified AASHTO density. The type and depth of compaction shall be as instructed by the Engineer. If necessary, roadbed material shall be temporarily bladed off to windrow in order to achieve the necessary depth of compaction.

Where any additional material shall be imported to obtain the specified level and layer thickness, where the thickness of the layer of imported material would be less than the specified layer thickness after compaction, then the roadbed material shall be scarified, the necessary imported material placed, and this combined material mixed and compacted to the full specified depth of the layer. The imported material shall be measured and paid for under "Cut and borrow to fill" and the roadbed material shall be measured and paid for under "Roadbed preparation and compaction of material".

**26.3.4.5 Cut and Borrow**

All suitable and approved materials excavated from the road prism shall, in so far as is practicable, be used for the construction of fills, pavement layers and mitre banks and for such other purposes as shown on the Drawings or as directed by the Engineer.

Where sufficient quantities of suitable cut material are not available, additional material shall be excavated from borrow areas shown on the Drawings or as directed by the Engineer. In lieu of borrow, cuttings may be widened or their slopes flattened, provided that the Engineer determines the need for such action before the Contractor starts work on any particular cutting.

All material required for the construction of the work shall, wherever possible, be obtained by the shortest haul distance from approved borrow areas being used.

The Engineer shall have the right to decide which sources of supply of approved material shall be used by the Contractor at any particular time.

Where satisfactory material is obtainable at shorter haul distances and the Contractor elects to use material which will require longer hauls, the Contractor will be paid at the rate for the shorter haul.

The Engineer may instruct that particular materials in Borrow pits or in cuts be selected for a specific purpose. Where selection is instructed by the Engineer, the method of excavation and the programme of work shall be so arranged as to avoid, in so far as is possible, double handling and to meet the requirement of the Engineer. In general the excavated materials shall be placed directly in their final positions in the fill.



**26.3.4.6 Construction of Fills**

The dimensions of fills shall be in accordance with the typical cross-section, details shown on the Drawings, as further defined or amended by the Engineer during the course of construction. Before starting construction, the Contractor shall obtain specifications regarding the required slope of each fill, any roadbed preparation required, the selection of materials, the methods and classification of compaction, and any other matter that may affect the construction of the fill or sequence of operations.

All materials used for the construction of fills shall, during excavating, placing and compacting, be broken down, placed and compacted as described below.

The layer thickness used for the construction of the fills will be maximum 200 mm.

The maximum size material for fill layers is 120 mm.

All fills will be compacted to 93% of Modified AASHTO density or, only if specified by the Engineer, compacted using 8 or more roller passes.

**26.3.4.7 Breaking down the Material**

Material from cuttings and Borrow pits will initially be broken down to maximum 300 mm before placement in the road.

Pavement layer and fill material shall be further broken down to the sizes as specified for each layer by using grid rollers, subject to the approval of the Engineer.

For the purposes of this Section, normal grid-rolling shall mean the following:

- a) The material shall be placed or bladed to the one side of the road to provide working space for breaking down the material.
- b) Subject to the approval of the Engineer a portion of the material shall be spread in a thin layer on a compacted surface to promote effective breaking-down of the material, and to a width which the grid roller shall be able to cover in a single pass.
- c) The grid roller, which shall proceed at a speed of at least 12 km/h and shall have a minimum mass of 13.5 tons, shall do four complete roller passes over the material.
- d) Any oversized material shall be removed by hand, and/or constructional equipment.
- e) The broken down material shall be placed in a windrow to the opposite side of the material still to be broken down.
- f) Repeat steps (ii) to (v), but place the second windrow next to the first.
- g) To mix the material, the two windrows formed in steps (ii) to (vi) shall then be bladed into a single windrow to the side of the road.

However, should too much oversize material be produced by normal grid-rolling, the Engineer may order additional normal grid-rolling which is represented by steps (ii) to (vii) above.

**26.3.4.8 Eight Roller Passes Compaction**

Where the degree of compaction cannot be satisfactorily controlled by way of testing the in situ density on account of the nature of the material, the Engineer may instruct that the material be

placed and compacted by eight passes (for every 200 mm of compacted layer thickness) by a combination of various items of compaction equipment. The Engineer may also instruct that the required number of passes be increased or decreased and that the payment be adapted accordingly.

The Contractor shall use a combination of both or any of a grid roller, or a vibratory roller. The Contractor shall base his tendered rates on the inclusion of four passes by a vibratory roller and four passes by a grid roller.

#### **26.3.4.9 Equipment**

The equipment shall comply with the requirements stated below.

##### **(a) Vibratory Roller**

The vibratory roller shall be capable of exerting a combined static and dynamic force of not less than 120 kN/metre-width for every metre of loose-layer thickness at an operation frequency not exceeding 25 Hz and shall move at a speed not exceeding 4 km/h.

##### **(b) Grid Roller**

The grid roller shall have a mass of not less than 13.5 tons when ballasted, it shall be loaded to this mass, and shall move at a speed of not less than 12 km/h.

#### **26.3.4.10 Reshaping and Compaction**

Reshaping and compaction will be required where the total reshaping of the existing gravel road is required, on instruction of the Engineer.

Reshaping and compaction will entail the cleaning of the formation of all vegetation (and the disposal thereof) by motor grader there after the area will be ripped, shaped, trimmed, watered to optimum moisture content and compacted to the required cross-sections and cambers. This procedure also includes cutting material from the sides to the crown and the shaping of the side drains.

Compaction will be done to 93% of Mod AASHTO density with a grid roller, or such other compaction equipment as approved by the Engineer.

The Contractor shall perform his own control testing at a minimum of six densities and two CBR's per kilometre of road. These test results shall be submitted for approval by the Engineer before payment will be made for the relevant Sections of roadbed.

#### **26.3.4.11 Road Blading**

##### **(a) Normal and Dry Road Blading**

Blading of gravel roads shall be carried out when instructed by the Engineer.

Blading to improve the riding surface shall be done where potholes, corrugations and rutting caused by poor drainage, have developed.

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Blading shall be carried out when gravel is at the correct moisture content (normal blading). If, in the opinion of the Engineer the road surface is too dry for blading, water carts shall be used to water the road ahead of the grader and during the blading operation (dry road blading). The Contractor shall determine the moisture content at which the material shall be bladed to facilitate the proper blading of the surface.

The first cut shall commence at the edge of the road and the material bladed towards the centre of the road. With successive cuts move windrow across the full width of the road. The depth of the first cut shall be at least as deep as the potholes and ruts. Cut from opposite side of the road and spread windrow evenly over full width of the road. No undercutting or small windrows which will prevent water flowing freely off the road surface or into culvert inlets shall be left. During the blading operations all large stones and vegetation shall be removed from the windrowed material. Any drains blocked by under cutting shall be opened and gravel spillage into culvert inlets and outlets removed.

The installation of prefabricated culverts may be required to improve drainage.

**(b) Quality Standard**

The road surface shall give a smooth ride, free from corrugations and shall be properly drained.

The specified camber for straight Sections of roads shall be maintained and super elevation on curves shall extend across the full width of the roadway.

**26.3.4.12 Layer works**

Each layer shall only be constructed provided that the underlying layer or fill conforms to the relevant requirements specified for that layer. Dumping of the material for the succeeding layer may not commence on a particular Section of road unless the Contractor has obtained, in writing, the Engineer's approval for the current layer. Immediately before placing the material, the underlying layer or fill shall be checked by the Contractor for damage or deficiencies, which shall be made good as instructed by the Engineer.

**26.3.4.13 Construction Tolerances for Gravel Wearing Course**

At least 10, but preferably more, layer thicknesses shall be determined in accordance with a stratified random pattern for each lot of completed layer work. Layer thickness may be determined by means of level measurements taken before and after construction of the layer in exactly the same position, but may be augmented by thickness measurements taken by means of holes made in the layer. Outliers shall be identified, disregarded, and if possible, replaced.

The lot will be considered to comply with the requirements for layer thickness if:

- a) At least 90% of all the thickness measurements taken before any thickness repairs are made is equal to or greater than the specified thickness, minus 21 mm; and
- b) The mean layer thickness of the lot is not less than the specified thickness minus 5 mm. Isolated spots where the actual thickness is less than the specified thickness less 27 mm shall be repaired so as to fall within the 21 mm tolerance.

**26.3.4.14 Compaction of Gravel Wearing Course**

The gravel wearing course will be compacted to 93% of Modified AASHTO density. At least 4 relative density determinations shall be taken in the case of fill and selected fill in accordance with a random pattern. After outliers have been examined and replaced, compliance with the specified density requirements shall adhere to Table 25/6 of Section 25 – Roadworks and Paving.

**26.3.4.15 Finishing the Slopes****(a) Cut Slopes**

The slopes of cuttings shall be trimmed to neat lines and to a standard which is generally attainable with proper care and workmanship in the type of material concerned. All loose rocks, stones and nests of loose material shall be removed, especially in solid-rock cuts, which must be completely free from such material. The final surface of side slopes shall have a slightly roughened surface which will be suitable for subsequent grassing or for establishing natural vegetation.

**(b) Fill Slopes**

Fill slopes shall be finished to neat lines with all loose rocks and uncompacted material removed. The degree of finish required shall depend on the nature of the material used for the fill slope but shall be as smooth as is consistent with the material involved and good workmanship.

No individual boulders occurring in otherwise smaller sized material shall be allowed to project beyond the surface. All excess fill shall be removed immediately.

**(c) General**

Cut and fill slopes shall be finished to a uniform appearance without any noticeable break which can be readily discerned from the road. The degree of finish required for all fill slopes and for cut slopes flatter than 1 in 4 shall be that normally obtainable by grader or hand-shovel operations.

**26.3.4.16 Classification of Cut and Borrow excavation**

The excavation of material from cut or borrow for fills (including excavations in existing roads where specified or agreed) shall be classified as specified in Section 9 – Bulk Surface Excavations and Trenching.

**26.3.4.17 Mechanical Modification**

Mechanical modification shall consist of the mixing of material originating from various sources, as described hereafter.

When the mixing of materials from various sources is required the material from the first source shall be dumped onto the road, prepared, broken down and spread in a layer of uniform thickness, after which it is lightly rolled with a steel-wheeled roller. The material from the second source shall then be dumped onto the road, prepared, broken down and evenly spread, after which the two materials shall be thoroughly mixed.

If necessary water shall be added to the material to bring it to the correct moisture content not more than 2% above optimum moisture content.

## **26.3.5 Patching of Existing Surfaced Roads and Reinstatement of Roads after Pipe Construction**

### **26.3.5.1 Scope**

This Section covers the breaking up and excavation of existing pavement layers by conventional means and the removal thereof to an approved spoil dump as well as the patching of existing pavement layers, excluding resealing or resurfacing. Also included in this Section is the patching of the existing road after installation of the pipeline.

Patching shall be any work to existing pavement layers with the purpose of repairing local failures, and which is carried out in an area that may have a width of less than 1 m, or a length of less than 25 m, or an area of less than 100 m<sup>2</sup>.

Patching involves excavating the existing failed sections and reconstructing the excavated pavement layers with the specified pavement material.

Compensation for work in restricted areas shall not be applicable to patching.

### **26.3.5.2 Classification of Excavated Material**

Material from existing pavements shall be classified as follows for excavation and processing purposes:

#### **(a) Existing Bituminous Material**

Existing bituminous material shall be asphalt or other bituminous seal or base material removed separately from the existing layers on the instruction of the Engineer. Where underlying material is broken down or excavated together with bituminous materials, the mixture will not be classified as bituminous material for payment purposes.

#### **(b) Non-cemented Material**

Non-cemented material shall be existing pavement material which can be ripped with the teeth of a 140G Caterpillar or similar grader.

#### **(c) Cemented Material**

Cemented material shall be existing pavement material which cannot be ripped with the teeth of a 140G Caterpillar or similar grader. Existing stabilized material will not necessarily be classified as cemented material.

### **26.3.5.3 Sawing**

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. Payment will be made for sawing only where specified on the Drawings or instructed, in writing, by the Engineer.

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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.

**26.3.5.4 Demarcation**

The Engineer will demarcate any failed areas to be repaired, and shall instruct the Contractor in regard to the repair work to be undertaken.

The Contractor shall give adequate notice to the Engineer of his intention to commence with repair work on any specific Section of the road so that the Engineer will have sufficient time to demarcate the area to be patched and repaired.

In addition to his specified responsibilities for the accommodation of traffic, the Contractor shall also be responsible for traffic accommodation during the demarcation work.

**26.3.5.5 Excavating Pavement Material**

Unless otherwise instructed by the Engineer, the patching shall have a neat rectangular shape. The existing material shall be excavated and removed to the full specified depth. Asphalt layers and surfacing shall be cut with approved sawing equipment.

Excavation for patching shall be cut with side slopes of approximately 60° to the horizontal.

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.

**26.3.5.6 Backfilling Excavations**

Excavations shall be backfilled with pavement material as specified in the project Specification and the backfilling shall be compacted and finished to the required levels.

The excavations will be backfilled with one or a combination of the following, as instructed by the Engineer:

- Asphalt surfacing;
- Asphalt base;
- Cement stabilized gravel (5%);
- Cement stabilised crushed stone (G1); or
- Cement and Emulsion treated crushed stone (1.5% cement + 1.5% net bitumen).

**26.3.5.7 Composition of Asphalt Base and Surfacing**

The rates and proportions used shall be determined to suit the materials used and conditions prevailing during construction. 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 he proposes to use in the mix, together with his proposed mix design as determined by an approved laboratory, to the Engineer, so that the Engineer may test the materials and confirm the use of the proposed mix if he is satisfied that it meets the specified requirements.

The design of the asphalt mixes shall be in accordance with the design guidelines of TRH8 and appropriate research results, and the mix properties and requirements shall be as specified in the project Specification.

#### **26.3.5.8 Compaction of Asphalt Surfacing and Base**

Compaction will be executed in layers not exceeding 75 mm.

### **26.3.6 Finishing the Road and Road Reserve and Treating Old Roads.**

#### **26.3.6.1 Scope**

This Section covers the final finishing and clearing up of the road and road reserve after construction, and scarifying and treating old roads and temporary deviations. This only applies to sites where the pipe crosses provincial and national roads where deviations were constructed as well as where pipe jackings were undertaken in order to clear all construction related debris and disruptions from the road reserve.

#### **26.3.6.2 Finishing the Road and Road Reserve**

After completion the seal, surfacing or patching, or gravel surface on gravel roads, the road and road reserve shall be cleared of all excess earth, stones, boulders, debris, litter, garbage and other waste material resulting from the construction of the Works or the use of the road. All finishing and clearing not previously undertaken or completed as specified shall be completed.

Culvert inlets and outlets, culvert barrels, and open drains shall be cleared of all debris, soil, silt and other material.

The surfacing shall be cleared of all dirt, mud and foreign objects. Dragging, pushing or scraping material across the finished surfacing shall not be permitted.

All junctions, intersections, islands, kerbing and other elements making up the completed Works shall be neatly finished off.

All materials resulting from the finishing operations shall be disposed of at approved locations not visible from the road, such as disused Borrow pits and dongas. The Contractor himself shall make his own arrangements with the owners of properties on which such materials are shall be deposited. Disposal shall be carried out in a neat and uniform manner.

#### **26.3.6.3 Treating Old Roads**

All old roads, temporary deviations, haul roads and construction roads shall, in so far as is practicable, be levelled with the original ground. Surfaces shall be scarified and broken up to a depth of 150 mm.

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Where required by the Engineer, in order to prevent soil erosion, banks, dykes or ditches shall be constructed over the old road to dimensions ordered by the Engineer.

All roads and temporary deviations treated as above shall be left in a neat and tidy state.

## 26.4 MEASUREMENT AND PAYMENT

The rates tendered under this Section shall not include for the general obligations, Contractor's Equipment and work deemed to be covered by the items provided in Section 1 - General.

### 26.4.1 Clearing and Grubbing

#### 26.001 Clearing and grubbing hectare (ha)

The unit of measurement for clearing and grubbing is the hectare. The quantity shall be taken as the area in hectare (to the nearest 0.01 ha) designated by the Engineer and cleared and grubbed in accordance with this Section.

The tendered rate shall include full compensation for all work necessary for the clearing and grubbing of the roadway and the removal, transporting and disposal of material, all as specified.

#### 26.002 Cleaning out of hydraulic structures:

- |   |                               |
|---|-------------------------------|
| a) Pipes with an internal diameter up to and including 750 mm | cubic metre (m <sup>3</sup> ) |
| b) Pipes with an internal diameter exceeding 750 mm           | cubic metre (m <sup>3</sup> ) |
| c) Box culverts up to and including 1.5 m vertical dimension  | cubic metre (m <sup>3</sup> ) |

The unit of measurement shall be the cubic metre of material removed from hydraulic structures where instructed by the Engineer so that the structures are cleaned as specified.

The tendered rates shall include full compensation for all work necessary for removing all undesirable materials from structures, transporting and disposing of these materials, as well as additional costs necessary for gaining access to such structures.

#### 26.003 Removing and relaying existing pipes (size indicated) Unit: metre (m)

The unit of measurement shall be the metre of existing pipe removed and re-laid.

The tendered rate shall include full compensation for lifting, loading, transporting for a free-haul distance of 5 km, off-loading, and laying pipes according to the Specification.

### 26.4.2 Earthworks and Layer works

#### 26.004 Roadbed preparation and the compaction of material

- |   |                                     |
|---|-------------------------------------|
| a) Compaction to 90% of modified AASHTO density | Unit: cubic metre (m <sup>3</sup> ) |
| b) Compaction to 93% of modified AASHTO density | Unit: cubic metre (m <sup>3</sup> ) |



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The unit of measurement shall be the cubic metre of roadbed material prepared and compacted as specified. The quantity shall be computed in accordance with the authorized dimensions of the completed layers.

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

<b>26.005</b>	<b>Compaction of material</b>	<b>Unit hectare (ha)</b>
a)	<b>Compacted to 90% of modified AASHTO density</b>	<b>Unit: cubic metre (m³)</b>
b)	<b>Compacted to 93% of modified AASHTO density</b>	<b>Unit: cubic metre (m³)</b>
c)	<b>Eight roller passes compaction</b>	<b>Unit: cubic metre (m³)</b>

The unit of measurement shall be the cubic metre of material measured in the compacted fill. For sub items (a), (b) and (c) the quantity measured shall be computed by the method of average end areas from levelled cross-sections prepared from the ground line after clearing and grubbing and the removal of topsoil and the completion of any preparatory roadbed treatment which may have been ordered by the Engineer, but prior to the construction of the fill, and the final specified or authorized fill cross-section superimposed thereon at 20 m intervals along the centre line of the road. All measurement shall be neat, and that part of the fill placed in excess of the authorized cross-section shown on the Drawings or directed by the Engineer, will not be paid for irrespective of the tolerances in workmanship allowed under the Contract.

<b>26.006</b>	<b>Variations in the number of roller passes (applicable to sub-sub item 26.005(c))</b>	
a)	<b>Vibratory rollers</b>	<b>square-metre-pass (m² - pass)</b>
b)	<b>Grid rollers</b>	<b>square-metre-pass (m² - pass)</b>

The unit of measurement shall be the square metre coverage, and shall be computed by multiplying the number of square metres to which the changed pass efforts apply by the increased or decreased number of roller passes.

Where a change in the compaction effort is requested, the Contractor will be compensated at the tendered rates for the above items in respect of the increased number of square-metre roller passes of each type of roller required over and above that specified in the relevant standard effort. His compensation will be decreased simultaneously, at the applicable rates, by the number of square-metre roller passes of each type of roller which is either decreased or completely left out.

The tendered rate for each additional square-metre-pass ordered by the Engineer over and above the specified number of passes shall include full compensation for all supervision, labour, equipment, fuel, materials, work and incidentals necessary for completing the work. The same rates shall be accepted by the Contractor during computation of a decrease in his compensation where the number of roller passes for each specific type of roller is decreased.

<b>26.007</b>	<b>Additional normal grid rolling</b>	<b>Unit: cubic metre (m³)</b>
---------------	---------------------------------------	-------------------------------

The unit of measurement shall be the cubic meter of compacted material upon which an additional “normal grid rolling operation” as described in Clause 26.3.4.8 is performed in accordance with the instructions of the Engineer.

## PART C3.1 - SPECIFICATION

The tendered rate shall include full compensation for performing one additional normal grid-rolling operation in addition to the initial normal grid-rolling operation the cost of which has been included in the Tender rates for pavement layers.

**26.008 Reshaping and compaction**

- |    |   |                             |
|----|---|-----------------------------|
| a) | <b>Compaction to 90% of modified AASHTO density (indicate road width)</b> | <b>Unit: Kilometre (km)</b> |
| b) | <b>Compaction to 93% of modified AASHTO density (indicate road width)</b> | <b>Unit: Kilometre (km)</b> |

The unit of measurement shall be the kilometre of reshaping and compaction measured along the centre line of the road.

The tendered rate shall include full compensation for clearing and disposal of vegetation, ripping, cutting material from the sides, shaping side drains, shaping the cross-sections to the specified camber, trimming by motor grader, watering and compacting the material to the specified density.

**26.009 Normal blading (indicate road width) Unit: Kilometre (km)**

The unit of measurement shall be the kilometre of full width of gravel road bladed, measured along the centre line of the road.

The tendered rate shall include full compensation for blading the road surface by motor grader and all labour required to remove large stones and keeping drainage clear from gravel spillage.

**26.010 Dry road blading (indicate road width) Unit: Kilometre (km)**

The unit of measurement shall be the kilometre of full width of gravel road bladed, measured along the centre line of the road.

The tendered rate shall include full compensation for blading the road surface by motor grader, adding water at a rate of 4 l/m<sup>2</sup> and all labour required to remove large stones and keeping drainage clear from gravel spillage.

**26.011 Variation in the rate of application of water for dry road blading Unit: Kilolitre (KI)**

The unit of measurement with respect to variations in the rate of application of water for dry road blading shall be the litre.

**26.012 Pavement layers constructed from gravel taken from cut or borrow**

- |     |  |  |
|-----|--|--|
| a)  | <b>Gravel selected layer compacted to:</b>                                 |  |
| i)  | <b>93% of Modified AASHTO density (specify compacted layers thickness)</b> | <b>Unit: Cubic metre (m<sup>3</sup>)</b> |
| ii) | <b>95% of Modified AASHTO density (specify compacted layers thickness)</b> | <b>Unit: Cubic metre (m<sup>3</sup>)</b> |

**b) Gravel wearing course compacted to:**

- i) 93% of Modified AASHTO density (specify compacted layers thickness)      Unit: Cubic metre (m<sup>3</sup>)**
- ii) 95% of Modified AASHTO density (specify compacted layers thickness)      Unit: Cubic metre (m<sup>3</sup>)**

The unit of measurement shall be the cubic metre of compacted pavement layer, and the quantity shall be calculated from the authorized dimensions of the completed layer.

The tendered rates shall include full compensation for procuring, as if from soft excavation or Borrow pits, breaking down, placing and compacting the material, including transporting the material for a distance of 1 km and the removal, disposal and transporting for a distance of 1 km, of up to 5% by volume of oversize material, and the protection and maintenance of the layer and the conducting of control tests, all as specified.

**26.013      Extra over item 26.012 for excavation of material in:      Unit: Cubic metre (m<sup>3</sup>)**  
**hard excavation**

The unit of measurement shall be the cubic metre of material obtained from hard excavation.

The tendered rates shall include full compensation for the additional costs involved for taking material from classes of material harder than soft excavation and for the additional costs, if any, for processing such material in the pavement layers.

**26.014      Removal of oversize pavement material      Unit: Cubic metre (m<sup>3</sup>)**

The unit of measurement shall be the cubic metre of oversize pavement material from cut and borrow, which cannot be broken down as specified, and is removed. The volume shall be determined as prescribed by the Engineer and shall be the loose volume in stockpiles or its equivalent measured in hauling vehicles. Only that volume of oversize pavement material in excess of 5% of the compacted volume of pavement layers will be measured for payment, all as specified.

**26.015      Mechanical modification (e/o untreated layer): by      Unit: Cubic metre (m<sup>3</sup>)**  
**mixing materials from different sources**

The unit of measurement shall be the cubic metre of compacted material that has been mechanically modified as specified, and the quantity shall be calculated in accordance with the authorized dimensions of the mechanically modified layer.

The tendered rates for mechanical modification shall be paid as extra over the rate for the construction of an untreated layer and shall include full compensation for all the work, equipment and other incidentals necessary for supplying and hauling the material for a distance of 1 km, and for mixing materials from different sources as specified.

---

**26.016      Edge beams at temporary accesses (class of concrete indicated)      Cubic: cubic metre (m<sup>3</sup>)**

The unit of measurement shall be the cubic metre of concrete in edge beams constructed as instructed.

The tendered rate shall include full compensation for furnishing all materials and labour, including formwork as necessary, placing concrete and shaping all surfaces and all excavations required (in all classes of material).

**26.017      Finishing-off cut and fill slopes:**

- |                            |  |
|----------------------------|--|
| <b>a)      Cut slopes</b>  | <b>Cubic: square metre (m<sup>2</sup>)</b> |
| <b>b)      Fill slopes</b> | <b>Cubic: square metre (m<sup>2</sup>)</b> |

The unit of measurement shall be the square metre of cut or fill slopes finished off as specified. The areas shall be measured from levelled cross-sections taken at 20 m intervals measured along the centre line of the road and shall be the sloping area between the shoulder breakpoint and the toe of the fill in the case of fill slopes, and the sloping area between the top of the cut slope and the toe in the case of cut slopes.

The tendered rates for finishing cut or fill slopes, medians and interchange areas shall include full compensation for all labour, equipment, materials and other incidentals and work required for finishing as specified, including the loading, transporting and disposal of any material brought down during the finishing operations.

**26.4.3      Patching of Existing Roads**

**26.018      Sawing asphalt layers for patching: to an average depth:**

- |   |                        |
|---|------------------------|
| <b>a)      Not exceeding 50 mm</b>                      | <b>Unit: metre (m)</b> |
| <b>b)      Exceeding 50 mm but not exceeding 100 mm</b> | <b>Unit: metre (m)</b> |

The unit of measurement shall be the metre of saw cut calculated in accordance with the authorized length of saw cut.

The tendered rate shall include full compensation for all Plant, equipment, labour, supervision, materials, transport and for all incidentals for sawing the asphalt complete as specified and prescribed by the Engineer, and also for work in restricted areas.

**26.019      Excavation in existing pavements for patching in:**

- |                                |  |
|--------------------------------|--|
| <b>a)      Asphalt layers</b>  | <b>Unit: cubic metre (m<sup>3</sup>)</b> |
| <b>b)      Sub base layers</b> | <b>Unit: cubic metre (m<sup>3</sup>)</b> |
| <b>c)      Base layers</b>     | <b>Unit: cubic metre (m<sup>3</sup>)</b> |

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

## PART C3.1 - SPECIFICATION

**26.020 Backfilling of excavations for patching with:**

- |    |  |                                     |
|----|--|-------------------------------------|
| a) | Continuously graded asphalt base (state type of bitumen and maximum size of aggregate)                       | Unit: ton (t)                       |
| b) | Continuously graded asphalt surfacing (state type of bitumen)  | Unit: ton (t)                       |
| c) | Emulsion treated crushed stone base (G1 stabilized with 1.5% net bitumen and 1.5% cement)                    | Unit: cubic metre (m <sup>3</sup> ) |
| d) | Cement stabilized crushed stone (G1 stabilized with 2.5% cement)   | Unit: cubic metre (m <sup>3</sup> ) |
| e) | Cement stabilized selected layer (G7 stabilized with 5% cement, compacted to 93% of Modified AASHTO density) | Unit: cubic metre (m <sup>3</sup> ) |
| f) | Selected backfill (G7 compacted to 93% of Modified AASHTO density)   | Unit: cubic metre (m <sup>3</sup> ) |
| g) | Selected backfill (G7 compacted to 95% of Modified AASHTO density)   | Unit: cubic metre (m <sup>3</sup> ) |
| h) | Gravel Wearing Course (As specified compacted to 95% of Modified AASHTO density)                             | Unit: cubic metre (m <sup>3</sup> ) |

The unit measurement shall be the ton of asphalt constructed as specified and measured according to certified weighbridge tickets issued in respect of mixture used. No payment will be made for material wasted.

The tendered rates shall include full compensation for procuring, furnishing, heating, mixing, placing and compacting of all materials as specified as well as process control testing, protecting and maintaining the work as specified. The tendered rate shall also include full compensation for weighing the material.

**26.021 Tack coat of 30% stable-grade emulsion****Unit : litre (ℓ)**

The unit of measurement shall be the litre of 30% stable-grade emulsion applied as specified.

The tendered rate shall include for the procuring, furnishing and application of the material as specified.

**26.022 Variation in active filler content:**

- |    |                                      |               |
|----|--------------------------------------|---------------|
| a) | Cement                               | Unit: ton (t) |
| b) | Lime                                 | Unit: ton (t) |
| c) | Milled granulated blast furnace slag | Unit: ton (t) |
| d) | Fly-ash                              | Unit: ton (t) |

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

#### 26.4.4 Accommodation of Traffic

##### 26.023 Accommodation of traffic and maintaining temporary deviations for:

- |    |  |                             |
|----|--|-----------------------------|
| a) | <b>Gravel roads being bladed, retrieved, or reconstructed in half-widths</b> | <b>Unit: kilometre (km)</b> |
| b) | <b>Surfaced roads being patched in half-widths</b>                           | <b>Unit: kilometre (km)</b> |
| c) | <b>Reinstatement of existing roads at crossings (full width deviation)</b>   | <b>Unit: kilometre (km)</b> |

The unit of measurement shall be the kilometre, measured along the centre lines of temporary deviations, existing roads used as temporary deviations, and roads constructed in half-widths. It shall not include sections along which the traffic is diverted onto existing roads where the Contractor is not responsible for the maintenance of such existing roads.

The tendered rate shall include full compensation for accommodating traffic and maintaining temporary deviations, including roads constructed in half-widths and existing roads used as temporary deviations during construction and maintenance periods, but excluding maintenance and repair work for which payment is specifically made under other pay items. The tendered rate shall also include full compensation for the provision of a full-time traffic safety officer and for all the duties performed by him. The tendered rate shall also include full compensation for the provision of communications equipment required for regulating the traffic, arranging for the moving of services, solving traffic problems, complying with the legal requirements of all authorities concerned, for providing temporary access to private property, and for the provision and maintenance of temporary drainage. The tendered rate shall also include full compensation for the specified general requirements and all incidental items of cost which are required under the provisions of section dealing with accommodation of traffic and which are not specifically paid for under other pay items provided.

Payment will be made in two equal instalments in respect of each section. The first instalment will be made when suitable temporary deviations have been approved for use or when traffic is taken over half-width construction. The second instalment will become due when the traffic can be accommodated on the new road, all temporary deviations have been obliterated and all general obligations of the Contractor have been complied with, all to the satisfaction of the Engineer.

#### 26.4.5 Finishing Road and Road Reserve and Treating Old Roads

##### 26.024 Finishing the road and road reserve

- |    |                                |                             |
|----|--------------------------------|-----------------------------|
| a) | <b>Dual carriageway road</b>   | <b>Unit: kilometre (km)</b> |
| b) | <b>Single carriageway road</b> | <b>Unit: kilometre (km)</b> |

The unit of measurement shall be the kilometre of road measured along the centre line. No separate measurement will be made for ramps at interchanges.

The tendered rates shall include full compensation for clearing, trimming, disposing of material, tidying and all other work to be undertaken for finishing off the road and road reserve as specified.

**26.025 Treatment of old roads and temporary deviations****Unit: kilometre (km)**

The unit of measurement shall be the kilometre of old road or temporary deviation treated.

The tendered rate shall include full compensation for levelling and scarifying and surfaces and tidying old roads and temporary deviations as specified. The rate will also include banks and dykes as required.

No payment will be made in regard to treating haul roads and construction roads, for which the Contractor shall make allowance in his rates specified elsewhere.