

## SECTION 5: SPECIAL SPECIFICATIONS

### SECTION 1 – GENERAL

#### 101 SPECIAL SPECIFICATIONS

Special specification is supplementary to the Standard Specifications and the two must be read in conjunction. In any case where there appears to be conflict between the two then the Special Specifications will take precedence.

#### 102 LOCATION OF CONTRACT

The project roads are located in Isiolo Urban Center of Isiolo County. The length is as shown below.

S/NO	ROAD NAME	ROAD LENGTH(KM)
1.	A2 – LITTLE ANGELS ROADS	0.4
	<b>TOTAL</b>	<b>0.4</b>

#### 103 EXTENT OF CONTRACT

The works to be executed under the Contract comprise mainly of but not limited to the following:-

1. **Road Works**
  - Clearance of road reserve
  - Earthworks
  - Construction of subbase with cement improved gravel
  - Construction of base with cement improved gravel
  - Application of MC30 & K160
  - Asphalt Concrete Wearing Course 50mm
  - Installation of road furniture and road marking
2. **Drainage Works**
  - Excavation/Cleaning of drains and culverts
  - Installation/repair of culverts
  - Protection works: Stone pitching and bed drain lining etc
3. **Maintenance of passage of traffic through and around the works.**
4. **Relocation of services.**
5. **Maintenance of works during Contract Period – Defect Liability Period shall be 3 months.**

S/NO	Activity	Scope of Works
1.	Periodic Maintenance of A2 – Little Angels Road	<ul style="list-style-type: none"> <li>• Site clearance and Top soil stripping</li> <li>• Earthworks</li> <li>• Construction of Sub-base and Base layers</li> <li>• Application of MC30 &amp; K160</li> <li>• Asphalt Concrete wearing course</li> <li>• Installation of road furniture and road marking</li> <li>• Drainage works.</li> </ul>

Any other activity not listed above in either category but deemed to be necessary by the Engineer, shall be subject to the Engineer's formal instructions within the mode of payment stipulated either by day works or on a measured basis.

#### 105 ORDER OF EXECUTION OF WORKS

In addition to Clause 105 of the Standard Specification the Contractor shall carry out the Works such that a continuous and consecutive output of fully completed work is achieved.

#### 107 TAKING OVER CERTIFICATE

The minimum length of the road for which a certificate will be issued under clause 48 of the conditions of Contract shall be the whole length of each section of the road substantially completed including road signs and road marking.

#### 109 NOTICE OF OPERATIONS

Add the following sub- Clause.

##### Notification Terms

It shall be the Contractor's responsibility to notify the Engineer when any item of works scheduled are completed and ready for approval, and the contractor shall give sufficient notice to allow control tests to be performed.

##### Explosive and Blasting

(a) The requirements of the Laws of Kenya governing explosives and other requirements and regulations of Government of Kenya and other authorities shall be complied with.

(b) No explosives of any kind shall be used without prior written consent of the Engineer.

The Contractor shall be solely responsible for the provision, handling, storage and transporting of all explosives, ancillary materials and all other items of related kind whatsoever required for blasting.

**117 HEALTH, SAFETY AND ACCIDENTS**

Add the following:

In addition to providing, equipping and maintaining adequate first aid stations throughout the works in accordance with the laws of Kenya, the contractor shall provide and maintain on site during the duration of the Contract, a fully equipped dispensary. This shall be with a qualified Clinical Officer / Nurse who shall offer the necessary medical advice on HIV and related diseases to the Engineer's and Contractor's Site staff. The Contractor shall allow for this in the rates and be responsible for all site welfare arrangements at his own cost.

**120 PROTECTION OF EXISTING WORKS AND SERVICES**

The Contractor shall acquaint himself with the position of all existing services such as sewers, water drains, cables for electricity and telephone, lighting and telephone poles, water mains, etc., before commencing any excavation or other work likely to affect the existing services.

The cost of all plant, equipment and materials, labour, technical and professional staff, transport and the like necessary for determining the locations of existing services, including the making good of any damage caused to such services all to the satisfaction of the Engineer, shall be deemed to be included in the tender rates. No other payment shall be made for the costs of such operations, nor for the making good of damage caused thereby to the existing services.

The Contractor shall be held responsible for injury to existing structures, works or services and shall indemnify and keep indemnified the Employer against any claims in this respect (including consequential damages).

**121 DIVERSION OF SERVICES**

- (a) The Contractor shall acquaint himself with the location of all existing services such as telephone lines, electricity cables, water pipes, sewers etc., before execution of any works that may affect the services. The cost of determining the location of the existing services together with making good or repairing of any damage caused all to the satisfaction of the Engineer shall be included in the BID rates.
- (b) Subject to the agreement with the Engineer, the Contractor shall be responsible for removal of alteration and relocation of existing services.
- (c) The Contractor shall indemnify the Employer against claims originating from damage to existing services or works.

**123 LIAISON WITH GOVERNMENT AND POLICE OFFICIALS**

The Contractor shall keep in close touch with the Police and the other Government officials of the area regarding their requirements in the control of

traffic or other matters, and shall provide all assistance or facilities, which may be required by such officials in the execution of their duties.

**124 LAND FOR ALL CAMPS SITES AND FOR THE CONTRACTOR'S OWN PURPOSES, INCLUDING TEMPORARY WORKS.**

Notwithstanding Clause 124 of the Standard Specification all requirements of land for temporary works and construction purposes shall be to the approval of the Engineer but the Contractor will make all necessary arrangements with the property owners concerned and pay all charges arising therefrom. On or before completion of the Contract, the Contractor shall remove all temporary works and shall restore all such land to the condition in which it was immediately prior to the occupation thereof as far as is reasonable and practicable. No separate payment will be made to the Contractor on account of these items and the Contractor must make due allowance for them in his rates.

Notwithstanding Clause 120 of the Standard Specifications, the Contractor shall be required to appoint competent surveyors who will liaise with the Engineer on matters related to the demarcation of the existing road reserve, site measurements, removal and reinstatement of existing services.

**128 STORAGE OF MATERIALS**

All materials shall be stored on Site in a manner approved by the Engineer and the Contractor shall carefully protect from the weather all work and materials which may be affected thereby.

**129 TEST CERTIFICATES**

When instructed by the Engineer the Contractor shall submit certificates of test from the suppliers of materials and goods required in connection with the works as the Engineer may require.

Such certificates shall certify that the materials or goods concerned have been tested in accordance with the requirements of the specifications and shall give the results of all the tests carried out. The Contractor shall provide adequate means of identifying the materials and goods delivered to the site with the corresponding certificates.

**131 SIGNBOARDS**

The Contractor shall provide and erect publicity signs on the site as stated in the BOQ. The Engineer shall, as shown in the Drawings, direct the minimum dimensions and thickness of the steel framework and sheet. The framework and sheet shall be prepared and painted black, while the ring at the top of the supporting frames shall be painted white. The wordings and KURA's logo shall be printed on backlit sticker paper resistant to the effects of weather using reflectorised paint or material approved by the Engineer. The sticker shall be

placed on both sides of the board. The colours, fonts and heights of the letters shall be as indicated on the typical drawings and as directed by the Engineer.

## 132 OFFICE FOR THE RESIDENT ENGINEER, SURVEY EQUIPMENT AND FURNITURE

### 132.1 ENGINEER'S REPRESENTATIVE OFFICE

The contractor, when instructed, shall for the duration of the Contract, furnish and equip Resident engineer's office located at the KURA's Regional offices. The room to be occupied by the Engineer's Representative and its front office shall be provided with a floor carpet to be approved by the Engineer. The windows shall be fitted with curtains and blinders.

A telephone shall also be provided for the Resident Engineer's office for his exclusive use. All the charges and fees related to the installation and maintenance of the telephone shall be deemed to have been included in the rates for providing and maintaining the Office. The Contractor will be reimbursed, separately, the cost of operating the telephone under appropriate bill item in the BoQ.

The offices shall be provided with day and night watchmen and security lights, the cost of which shall be deemed to have been included in the rates for the offices.

The Contractor may be instructed by the Engineer under clause 58 of the General Conditions of Contract to make payments of general receipted accounts for such items as stationery, stores, furniture and equipment, claims and allowances for supervision personnel and any miscellaneous claims or the Engineer may direct the Contractor to purchase or pay for the above. The Contractor will, on provision of receipts, be paid under appropriate bill items in the BoQ.

#### **The survey equipment to be provided would include:**

- |  |      |
|--|------|
| 1. Engineer's automatic level Wild NAK 2 or similar  | 2No  |
| 2. Total station reading 1" with tripod and setting on pole with datalogger and survey software to match Total Station Datalogger. Include data transfer program, and plotting modes, setting out calculations and Cogo facilities | 1No  |
| 3. Levelling staff 5m. with levelling bubble Wild GNLE or similar  | 4No  |
| 4. 50m. steel band measuring tape  | 2No  |
| 5. 30m. linen measuring tape   | 2No. |
| 6. 3m. aluminum straight edge  | 2No  |
| 7. 1m. stainless steel straight edge   | 1No  |
| 8. 100m. steel band tape   | 2No. |
| 9. Draughtsman's stool   | 3No. |
| 10. Complete set of highway curves   | 1No  |
| 11. Programmable scientific calculators FX 880P or equivalent  | 4No  |
| 12. Survey umbrella  | 2No. |
| 13. Roll of tracing paper  | 10No |
| 14. Protractor 360   | 2No  |

15. Graph paper A3 size	100No
16. Drawing table	2No.
17. Erasing shield	4No.
18. 3m. ranging rods	9No
19. Marker pens	30No.

The contractor may be directed to pay for stationery, equipment or reagents that are foresaid and also pay for servicing and repair of the laboratory equipment being used on the project.

The Contractor shall provide, install and maintain in a good state of repair, such survey and other equipment as listed for the duration of the contract.

Such equipment shall be of approved manufacture, and shall be made available to the Engineer for the Engineer's exclusive use throughout the Contract, not later than three (3) weeks after the Engineer's order to supply. All equipment shall be ready to use and complete to perform the tests. The equipment shall revert to the Employer on completion of the Contract.

Any delays to the Contractor or the Contractor's activities caused by the Engineer being unable to perform survey work, field or laboratory tests due to the contractor's failure to supply and/or maintain the said equipment shall be deemed to have been caused entirely by the Contractors own actions, and any consequences of such delays shall be interpreted as such.

The payment to comply with this requirement is provided in the Bill of Quantities and ownership of all equipment paid for as instructed above shall revert to the Employer after the completion of the Works.

Failure by the Contractor to provide or maintain the equipment shall make him responsible to bear all costs that may be incurred as a result of the Engineer's staff using alternative means of communication, including delays in supervision and approval of Works by the Engineer.

### **132.3 COMMUNICATION FOR THE ENGINEER**

#### **(a) Mobile phones**

The Contractor shall provide, connect and maintain mobile phones for the exclusive use by the Engineer for the duration of the contract. The Contractor shall include for the cost of providing the mobile units complete with charger unit, "hands free" headset for each unit, connection to the network and all service charges applicable all as directed by the Engineer. The Contractor shall provide air-time with each mobile phone which shall be paid for under prime cost sum allowed for in the bills of quantities. The mobile telephones shall be WAP enabled with e-mail capabilities and integrated camera of a minimum of 3.0 mega pixels. Payment for these mobiles and associated costs is included in the Bill of Quantities, and ownership of mobile phones will revert to the Employer after completion of the Works.

#### **(b) Internet and e-mail services**

Where directed, the contractor shall provide 24 hours terrestrial or wireless internet connectivity with minimum throughput speed of 128kilobytes per second for the exclusive use by the Engineer, including all accessories and Terminal Equipment and pay for all associated installation, maintenance and usage charges throughout the duration of the contract.

The contractor shall allow for the provision and maintenance of internet connectivity and associated costs as per Appendix to item 1.17 of the Bills of Quantities.

### **137 ATTENDANCE UPON THE ENGINEER AND HIS STAFF**

In addition to the staff stated in Clause 135, the following staff will be provided for the supervision of work: 1No. Artisans, 2No. Labourers, 1No. Office assistants, 2No. Lab attendants. Additional attendant staff, as required by the Engineer, shall be paid for under Item 01-80-030 of the Bill of Quantities.

### **138 VEHICLES AND DRIVERS FOR THE ENGINEER AND HIS STAFF AND METHOD OF PAYMENT**

In addition to provisions of the Clause 138 of the Standard Specification, the Contractor shall when instructed, provide and maintain in good working condition for the exclusive use of the Engineer and his staff throughout the Contract, the following types and numbers of brand new vehicles or as specified. The Engineer shall approve the type of vehicles and confirm the number of each type to be provided. The Contractor shall insure the vehicles comprehensively for any licensed drivers and shall provide competent drivers during normal working hours and whenever required by the Engineer. The cost of provision of the vehicle shall be inclusive of the first 4,000 kilometers travelled in any month.

Should any vehicle supplied not be in roadworthy condition, the Contractor shall provide an acceptable equivalent replacement vehicle until such a time as the original vehicle is repaired to the satisfaction of the Engineer and returned for use.

#### **(a) Type 1 Vehicles (Double Cabin 4WD Pick up)**

Type 1 Vehicles should be four Wheel Drive (4WD), with power assisted steering, Double wishbone independent suspension at front axle and rigid axle with leaf springs at rear, diesel propelled engine maximum 2,500 cc. The starting mileage of the vehicles shall not exceed 60,000km odometer reading. The vehicles should be fitted with other accessories below:

- (a) Spare tyre and wheel jack;
- (b) FM radio and CD player;
- (c) Power Windows;
- (d) Full Air-conditioning;
- (e) Immobilizer and antitheft security system;
- (e) Driver and passenger SRS Airbags;
- (f) Canvas cover over the carrying deck at the back.

At the end of the contract, all type 1 vehicles shall revert to the Contractor.

#### **(c) Type 2 Vehicles (station wagon/saloon)**

Specifications for Type 2 Vehicles shall be station wagon/saloon vehicles; petrol propelled engine maximum 1,800 cc. The starting mileage of the vehicles shall not exceed 60,000km odometer reading. shall in addition be fitted with a fibre glass body or similar and two columns of sitting benches on the carting deck at the back.

The Contractor shall insure comprehensively the vehicles for any licensed drivers and shall provide competent drivers during normal working hours and whenever required by the Engineer.

At the end of the contract, all type 2 vehicles shall revert to the Contractor.

Payment of vehicle shall be per vehicle month in item 01-80-017/18 of the BOQ.

### **139 MISCELLANEOUS ACCOUNTS**

The Contractor maybe instructed by the Engineer to make payments of general miscellaneous accounts for such items as stationary, stores and equipment and miscellaneous supervision personnel and claims or the Engineer may direct the Contractor to purchase or pay for the above. The Contractor will be paid on a prime cost basis plus a percentage for overheads and profits under appropriate items in the Bills of Quantities.

### **142 ENVIRONMENTAL PROTECTION**

The Contractor shall comply with the Statutory Regulations in force in Kenya regarding environmental protection and waste disposal, and shall liaise with the National Environmental Management Agency (NEMA).

The Contractor shall ensure so far as is reasonably practicable and to the satisfaction of the Engineer; that the impact of the construction on the environment shall be kept to a minimum and that appropriate measures are taken to mitigate any adverse effects during the construction.

- (a) The Contractor shall exercise care to preserve the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, all trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage by the Contractor's construction operations and equipment. All unnecessary destruction, scarring, damage or defacing resulting from the Contractor's operations shall be repaired, replanted, reseeded or otherwise corrected as directed by the Engineer, and at the Contractor's expense.
- (b) The Contractor shall ensure that measures are in place to control soil erosion and water pollution, by use of berms, dykes, silt fences, brush barriers, dams, sediment basins, filter mats, netting, gravel, mulches, grasses, slope drains, contour banks, and other erosion control devices and methods. Temporary erosion control provisions shall be coordinated with permanent erosion control features to assure economical, effective and continuous measures throughout the period of the works. The Contractor's attention is drawn to the requirements of Clause 502, in that works need to be progressively finished so that permanent vegetation can establish quickly to mitigate soil erosion and erosion of drains.
- (c) The Contractor shall provide all the labour, equipment, materials, and means required and shall carry out proper and efficient measures wherever and as often as necessary to minimise the dust nuisance.
- (d) The Contractor shall comply with all applicable Kenyan laws, orders and regulations concerning the prevention, control and abatement of excessive noise. Blasting, use of jackhammers, pile driving, rock crushing, or any other activities producing high-intensity impact noise may be performed at night only upon approval of the Engineer.



- (e) Immediately after extraction of materials, all borrows pits shall be backfilled to the satisfaction of the Engineer. In particular borrow pits near the project road shall be backfilled in such a way that no water collects in them.
- (f) Spilling of bitumen fuels Oils and other pollutants shall be cleared up.
- (g) The Contractor's attention is drawn to the requirements of the Standard Specification in regard to the environment and in particular to the following clauses:
  - Clause 115: Construction Generally
  - Clause 116: Protection from Water
  - Clause 136: Removal of Camps
  - Clause 605: Safety and Public Health Requirements Clause
  - Clause 607: Site Clearance and Removal of Topsoil and Overburden
- (h) No additional payment will be made to the Contractor to cover costs arising from the requirements for this Clause and the Contractor must include these costs in the rates inserted into the Bills of Quantities.

#### **143 STAFF TRAINING**

The Contractor shall allow for training of engineers, technicians and other support staff as may be instructed by the Engineer.

The payment of the allowances of such staff shall be made as instructed by the Engineer under the relevant provisions in the Bills of Quantities.

#### **SECTION 2 - MATERIALS AND TESTING OF MATERIALS**

All materials testing shall be in accordance with Section 2 of the Standard Specifications.

#### **SECTION 3 - SETTING OUT & TOLERANCES**

##### **301 SETTING OUT**

- a) In addition to the provisions of clause 3.01(a) if the traverse points to be used for the setting out are close to the existing carriageway and interfere with construction works then the Contractor will have to relocate them to a location where they will not be disturbed. The co-ordinates and heights of all traverse points so located shall be listed and provided to the Engineer for checking and/or approval. Contractor shall also monument the new centreline every 200m along straight and all salient points along curves by a pin in the concrete beacon before commencement of any works.

The road reserve boundary posts shall have 12mm diameter steel pins embedded in concrete, 200mm long with 25mm exposed to the air, sticking out from its top surface. This pin shall be coordinated and

heighted and result of the same shall be provided to the Engineer for approval. Cost of these works shall be included in the rates as no separate item has been provided.

Commencement of the works shall not be permitted until this basic survey data has been provided and approved by the Engineer for at least 2 Kms of the road.

b) Detailed Setting Out

Reference pegs shall be 50mm by 50mm in section 600mm long driven 400mm firmly into ground and painted white above the ground. The offset from centre line shall be indicated by small nail 20mm to 25mm long with its head driven flush with the top of the peg.

Chainages, offset and reference elevation shall be clearly indicated to the sides of the peg to the satisfaction of the Engineer.

After cutting of benches and prior to commencement of earthworks or subgrade works, Contractor shall take cross-sections again and submit the copy of the same to Engineer for agreement. These cross-sections shall then be used as basis of measurement for all subsequent layers, unless otherwise stated.

## **SECTION 4- SITE CLEARANCE AND TOP SOIL STRIPPING**

### **401 SITE CLEARANCE**

Site Clearance shall be carried out as directed by the Engineer.

### **402 REMOVAL OF TOPSOIL**

Topsoil shall include up to 200mm depth of any unsuitable material encountered in existing or newly constructed drains, drainage channels, and accesses.

### **403 REMOVAL OF STRUCTURES, FENCES AND OBSTRUCTIONS**

When instructed by the Engineer, the Contractor shall demolish or remove any structure and payment for this shall be made on day works basis.

## **SECTION 5 - EARTHWORKS**

### **504 PREPARATION PRIOR TO FORMING EMBANKMENT**

Where benching is required for existing pavement to accommodate earthworks subgrade or subbase for widening the road, the rate for compaction of existing ground shall be deemed to cover this activity.

Excavation in the pavement of the existing road shall be kept dry. In the event of water penetrating the underlying layer, construction of the subsequent layers shall be postponed until the underlying layers are dry enough to accommodate the construction plant without deforming or otherwise showing distress.

Step construction shall be carried out per layer at the joint where excavating both vertically and perpendicular to the direction of the travel. The step shall be 500mm perpendicular to the direction of the travel and 150mm vertical unless otherwise instructed by the Engineer.

Special care shall be taken when compacting the new material at the joint ensuring that specified density is achieved.

### **505 CONSTRUCTION OF EMBANKMENTS**

Only material approved by the Engineer shall be used for fill in embankments. Material with high swelling characteristics or high organic matter content and any other undesirable material shall not be used, unless specifically directed by the Engineer. Unsuitable material shall include:

- (i) All material containing more than 5% by weight or organic matter (such as topsoil, material from swamps, mud, logs, stumps and other perishable material)
- (ii) All material with a swell of more than 3% (such as black cotton soil)

- (iii) All clay of plasticity index exceeding 50.
- (iv) All material having moisture content greater than 105% of optimum moisture content (Standard Compaction)

Subgrade: Shall mean upper 300mm of earthworks either insitu or in fill and subgrade shall be provided for as part of earthworks operation and payment shall be made as “fill”. The material for subgrade shall have a CBR of not less than 10% measured after a 4 day soak in a laboratory mix compacted to a dry density of 100% MDD (AASHTO T99) and a swell of less than 1%.

Subgrade repair: Where directed by the Engineer, any localized failure in the subgrade shall be repaired by filling in selected soft, hard or natural of minimum CBR 30% and compacted in accordance with clauses in the specifications applying to normal subgrade.

Embankment repair: Where directed by the Engineer, any localized filling in soft, hard or natural; selected material requirements shall be executed in accordance with Clause 505.

**508**

#### **COMPACTION OF EARTHWORKS**

At pipe culverts, all fill above ground level around the culverts shall be compacted to density of 100% MDD (AASHTO T.99) up to the level of the top of the pipes or top of the surround(s), if any and for a width equal to the internal diameter of the pipe on either side of the pipe(s) or surround(s) as applicable.

At locations adjacent to structures, all fill above ground level upto the underside of the subgrade shall be compacted to density of 105% MDD (AASHTO T.99). In case of fill around box culverts this should be carried out for the full width of the fill and for a length bounded by the vertical plane passing through the ends of the wingwalls.

Notwithstanding the provision of clause 503 of the standard Specification, Compaction of subgrade material (i.e. material immediately below formation) in cut areas shall not be carried out by the contractor in areas where the formation is formed in hard material, unless specific instructions to the contrary are issued by the Engineer.

Where improved sub-grade material shall be required, this shall be compacted and finished to the same standards and tolerances as those required for normal subgrade and clauses in the specifications applying to normal subgrade shall also apply.

**511**

#### **BORROW PITS**

The first part of the Standard Specification is amended as follows:-

Fill material which is required in addition to that provided by excavation shall be obtained from borrow pits to be located and provided by the Contractor but to the

approval of the Engineer contrary to what has been stated.

**517 MEASUREMENT AND PAYMENT**

Notwithstanding the provisions of clause 517 of the standard specifications, the rate for compaction of fill in soft material shall allow for the requirements of clause 508 of the special specification and no extra payment shall be made for compaction around pipe culverts (100% MDD AASHTO T.99).

**SECTION 6 - QUARRIES, BORROW PITS, STOCKPILES AND SPOIL AREAS**

**601 GENERAL**

Notwithstanding any indications to the contrary in the Standard specification the Engineer will not make available to the Contractor any land for quarries, borrow pits, stockpiles and spoil areas, except for those areas in road reserves specifically approved by him.

The contractor will be entirely responsible for locating suitable sources of materials complying with the Standard and Special Specifications, and for the procurement, Wining, haulage to site of these materials and all costs involved therein. Similarly the contractor will be responsible for the provision and costs involved in providing suitable areas for stockpiling materials and spoil dumps. Should there be suitable sites for spoil dumps or stockpiles within the road reserve forming the site of the works the Contractor may utilize these subject to the approval of the Engineer.

No additional payment will be made to the Contractor to cover costs arising from the requirements for this Clause and the Contractor must include these costs in the rates inserted into the Bills of Quantities.

**602 MATERIAL SITES**

The information on possible material sites is given for the general guidance of bidders. Bidders are however advised to conduct their own investigation as the information contained therein is neither guaranteed nor warranted

**603 PROVISION OF LAND**

Notwithstanding any indications to the contrary in the Standard specification the Engineer will not make available to the Contractor any land for quarries, borrow pits, stockpiles and spoil areas, except for those areas in road reserves specifically approved by him.

The contractor will be entirely responsible for locating suitable sources of materials complying with the Standard and Special Specifications, and for the procurement, Wining, haulage to site of these materials and all costs involved therein. Similarly the contractor will be responsible for the provision and costs involved in providing suitable areas for stockpiling materials and spoil dumps.

Should there be suitable sites for spoil dumps or stockpiles within the road reserve forming the site of the works the Contractor may utilize these subject to the approval of the Engineer.

No additional payment will be made to the Contractor to cover costs arising from the requirements for this Clause and the Contractor must include these costs in the rates inserted into the Bills of Quantities.

**605 SAFETY AND PUBLIC HEALTH REQUIREMENTS**

In addition to clause 605, the contractor shall allow for professionals to conduct lectures to the workers regarding the spread of HIV/Aids.

**SECTION 7 - EXCAVATION AND FILLING FOR STRUCTURES**

**703 EXCAVATION OF FOUNDATIONS FOR STRUCTURES**

Unless otherwise instructed by the Engineer, all excavated surfaces in material other than hard material, on which foundations for structures shall be placed, shall be compacted to 100% MDD (AASHTO T.99) immediately before structures are constructed.

Paragraph 4, last line: - Replace "95%" with "100%".

**707 BACKFILLING FOR STRUCTURES**

Unless otherwise instructed by the Engineer, all backfilling material shall be compacted to a minimum of 100% MDD (AASHTO T.99).

**709 EXCAVATIONS FOR RIVER TRAINING AND NEW WATER COURSES**

Payments for river training and establishment of new watercourses shall only be made where such work constitute permanent works. Works done for road deviation or other temporary works shall not qualify for payment.

**710 STONE PITCHING**

Stone pitching to drains, inlets and outlets of culverts to embankments and around structure shall consist of sound unweathered rock approved by the Engineer. The stone as dressed shall be roughly cubical in shape with minimum dimensions of 150 x 150mm for normal thickness of stone pitching.

The surface to receive the pitching shall be compacted and trimmed to slope and the stone laid, interlocked and rammed into the material to give an even finished surface.

In areas where stone pitching has been damaged, the Contractor shall identify such areas and notify the Engineer for his agreement of the extent of the Works

required and his approval and instructions to proceed with the Works. Stone Pitching Repair and Reconstruction shall be carried out in accordance with Clause 710 of the Standard Specifications.

The Works shall involve removal of the damaged stone pitching and reconstruction of the said areas in accordance with Clause 710 of the Standard Specifications by use of the sound salvaged material together with any necessary additional material where all such materials shall comply with Section 7 of the Standard Specifications.

Contrary to clause 713 of the standard specifications, the rates inserted for stone pitching shall allow for grouting.

#### **711 GABIONS**

Where instructed by the Engineer the Contractor will install gabions as protection works to washout areas or bridge Piers and or Abutments. Gabions shall be constructed in accordance with Clause 711 of the Standard Specification.

In cases where existing gabions have been damaged, the Contractor shall identify them and notify the Engineer for his agreement of the extent of the Work required and his approval and instructions to proceed with the Works.

The Works shall involve removal of the damaged gabions / rocks, excavation to the correct levels and grades as directed by the Engineer, and in accordance with Clause 711 of the Standard Specifications and reconstruction with new gabions and other necessary materials as necessary. The damaged gabions shall be recovered and transported to the nearest KURA'S Yard or M.O. R &P.W Department depot.

#### **712 RIP-RAP PROTECTION WORK**

Quarry waste or similar approved material shall be used to backfill scoured and eroded side, outfall and cut-off drain. The material shall be compacted to form a flat or curved surface preparatory to stone [pitching of drainage channels, existing and new scour checks as directed by the Engineer.

The surface to receive the pitching shall be compacted and trimmed to slope and the stone hand laid, interlocked and rammed into the material to give an even finished surface. The interstices of the Pitching shall be rammed with insitu material. The insitu material immediately behind the pitching shall be compacted to minimum density of 100% MDD compaction (AASHTO T.99)

#### **714 BACKFILL BELOW STRUCTURES**

Where instructed this shall be carried out in compliance with the requirements of Clause 507 and 804 of the Standard Specification.

## **SECTION 8 - CULVERTS AND DRAINAGE WORKS**

### **801 SCOPE OF SECTION**

The operations specified in this section apply to the installation of drainage works and reinstatement and improvement of the same.

In addition, this Section covers: -

- Extending of existing 450mm, 600mm and 900mm diameter pipes to be compatible with the increased road width or access.
- Desilting and cleaning of existing pipes and outfall drains to make them free flowing.

### **804 EXCAVATION FOR CULVERTS AND DRAINAGE WORKS**

In the Standard Specifications, make the following amendments: -

(a) In paragraph 6, line 3, and in paragraph 7, line 5 and in paragraph 11, line 6, delete "95%" and insert "100%".

(b) Removal of Existing Pipe Culverts

Where instructed by the Engineer, the Contractor shall excavate and remove all existing blocked or collapsed culvert pipes of 450mm, 600mm and 900mm diameter including concrete surround, bedding, inlet and outlet structure.

The void left after removal of culvert pipes shall be widened as necessary to accommodate new concrete bedding, pipe and haunching.

The payment of this work shall be per linear metre of pipes removed, and the volume in m<sup>3</sup> of inlet/outlet structure removed. The void left by removal of these pipes shall be carefully preserved in order to accommodate replacement of 450mm, 600mm or 900mm diameter pipe culverts as shall be directed by the Engineer.

(c) Removal of Other Existing Drainage Structures

When instructed by the Engineer, the Contractor shall demolish or remove any other structure and payment for this shall be made on day work basis.

(d) Excavation for Culverts and Drainage Works

The Contractor shall carry out all excavations for new culverts and drainage works to the lines, levels, inclinations, and dimensions shown on the drawings or as instructed by the Engineer.

### **805 EXCAVATION IN HARD MATERIAL**

In the Standard Specifications, Sub-clauses 805(a) and 805 (b) delete "95%" and insert "100%".



In sub-clause 809(a), paragraph 1, line 1, substitute "95%" with "100%".

In sub-clause 809(c), paragraph 2, line 4, between the words "compacted" and "and shaped" insert the words "to 100% MDD (AASHTO T.99)".

Hard material is material that can be excavated only after blasting with explosives or barring and wedging or the use of a mechanical breaker fitted with a rock point in good condition and operated correctly. Boulders of more than 0.2m<sup>3</sup> occurring in soft material shall be classified as hard material.

#### **809 BEDDING AND LAYING OF PIPE CULVERTS**

Concrete pipes shall be laid on a 150mm thick concrete bed of class 15/20 and the pipes shall be bedded on a 1:3 cement: sand mortar at least 50mm thick, 150mm wide and extending the full length of the barrel.

The rates inserted shall allow for compaction of the bottom of excavation to 100% MDD (AASHTO T.99).

#### **810 JOINTING CONCRETE PIPES**

The concrete pipes for the culverts shall have ogee joints and will be jointed by 1:2 cement: sand mortar and provided with fillets on the outside as described in clause 810 of the Standard Specification.

#### **812 BACKFILLING OVER PIPE CULVERTS**

In the Standard Specifications, clause 812

- a) Wherever the expression "dry density of 95% MDD (AASHTO T. 99)" occurs delete and replace with "dry density of 100% MDD (AASHTO T.99)".

The rates entered for laying of pipe culverts shall allow for backfilling to pipe culverts and compacting to 100% MDD (AASHTO T.99) and these works shall not be measured and paid for separately.

#### **814 SUBSOIL DRAINS**

In the event of excavation for repairs exposing local seepage, springs or unacceptably high water table, the Engineer may instruct the provision of counter fort or French drains.

These drains shall consist of a trench excavated to the alignment, width, depth and gradient instructed by the Engineer, and backfilled with approved compacted clean hard crushed rock material as specified in clause 815 of the standard specification. Where these drains lie within the carriageway the carriageway shall be reinstated with compacted stabilized gravel and surfaced with hot asphalt or a surface dressing as instructed by the Engineer.

**815                    INVERT BLOCK DRAINS AND HALF ROUND CHANNELS**

Invert Block Drains and Half Round Channels shall be constructed as shown in the drawings provided in accordance with the Standard Specifications where directed by the Engineer.

**817                    REPAIRS TO DRAINS**

**817.1                Cleaning and Repair of Existing Drains**

In areas of existing side drains, mitre or outfall drains where such are blocked, the Engineer shall instruct the Contractor to clean and clear the drains to free flowing condition.

The work shall consist of:

- (a)     Stripping and removal of any extraneous material to spoil including vegetation and roots in the drains to the satisfaction of the engineer.
- (b)     Spreading of any spoil to the satisfaction of the Engineer.

Shaping the drains to free flowing condition as directed by the Engineer.  
Removing any broken side slabs for inverted block drains and replacing with a new removing any broken inverted block drains and replacing with a new one well jointed.

Measurement and Payment for cleaning drains shall be by linear metre of drain cleaned measured as the product of plan area and vertical depth of extraneous material instructed to be removed. No extra payment will be made for removal of vegetation and roots.

**817.2                Channels**

The Engineer may instruct that the Contractor provides open channels in place of existing subdrains where the latter may be damaged or in any other place. The rates entered by the Contractor in the bills of quantities must include for removal and disposal of any subdrain material, excavation to line and level, backfilling and compaction as directed by the engineer. The channels shall be constructed of precast class 20/20 concrete of minimum 80mm thickness and lengths or widths not exceeding 1000mm. Joints shall be at least 15mm wide filled with 1:2 cement sand mortar.

**817.3                Rubble fills for protection work**

Quarry waste or similar approved material shall be used to back fill scoured and eroded side, outfall and cut-off drains. The material shall be compacted to form a flat or curved surface preparatory to stone pitching of drainage channels, existing and new scour checks as directed by the Engineer.

**817.4 Stone Pitching**

Stone pitching shall be constructed in accordance with clause 710 of the standard Specification.

**817.5 Gabions**

Gabions shall be constructed in accordance with clause 711 of the standard Specification.

**817.6 Spoil Material**

The Contractor shall be responsible for removal from site of all materials excavated in the course of undertaking works in this section of the specifications, unless suitable for re-use, and deposit of the material in a spoil dump to be approved by the Engineer.

**818 SCOUR CHECKS**

Scour checks are to be constructed in mass concrete in accordance with clause 818 of the standard Specifications and the drawings as shall be provided.

**819 CLEANING AND MAINTENANCE**

**819.1 Desilting of Pipe Culverts**

Where instructed, Contractor shall desilt the existing pipe culverts by removing all the material from the pipe to make them clean and free flowing.

Measurement and payment shall be by the linear metres of pipes de-silted, regardless of diameter size.

## SECTION 9 - PASSAGE OF TRAFFIC

### 901 SCOPE OF THE SECTION

The Contractor shall so arrange his work to ensure the safe passage of the Traffic at all times and if necessary construct and maintain an adequate diversion for traffic complete with all the necessary road traffic signs.

The contractor shall provide to the satisfaction of the Engineer adequate warning signs, temporary restriction signs, advance warning signs, barriers, temporary bumps and any other device and personnel equipped with two way radios to ensure the safe passage of traffic through the works.

When carrying out the Works the Contractor shall have full regard for the safety of all road users.

The Contractor shall also provide sign posts and maintain to the satisfaction of the Engineer all deviations necessary to complete the works. The contractor should allow for the costs of complying with the requirements of this clause in his rates.

The contractor will be deemed to have inspected the site and satisfied himself as to the adequacy of his bid for these works and no additional payments will be made to the contractor for any expenditure on traffic control or the provision of deviations. The employer shall not be liable for inadequate prior investigations of this nature by the contractor.

### 903 MAINTENANCE OF EXISTING ROADS

The Contractor shall when instructed, maintain the existing project road ahead of works using compacted asphalt concrete type I in accordance with the provisions in clause 1601B – 1607B of the Special Specifications or gravel material depending on the nature of the wearing course surface.

### 904 CONSTRUCTION OF DEVIATIONS

#### (a) General

In addition to requirement of this clause, the Contractor shall when instructed construct and complete deviations to the satisfaction of the Engineer before commencing any permanent work on the existing road. Also during these works the contractor is supposed to provide a detour of adequate pipe culverts for pedestrian and traffic crossing where there is bridge works.

Subject to the approval by the Employer, the Contractor may maintain and use existing roads for deviation. Payment for this, made in accordance with clause 912 (a) (i), shall be by the Kilometre used depending on the type of road used, whether bituminous or earth/gravel. The rates shall include for the provision of materials and the works involved.

#### b) Geometry

The carriageway width of the deviations shall not be less than 6m wide and suitable for 2-way lorry traffic unless otherwise specified.

c) **Construction**

Unless otherwise instructed gravel wearing course for the deviation shall be 150mm compacted thickness complying with section 10 of the Standard Specification. The Contractor shall allow in his rate for removal of any unsuitable material before placing of gravel wearing course, as this will not be paid for separately.

In addition to provision of this clause, Contractor is required to sprinkle water at least 4 times a day at the rate of 1 to 1.4 litres/M<sup>2</sup> in regular interval to minimize the effects of dust. Latest sprinkling time shall be one hour before the sunset.

Where existing neighboring roads are used as deviation, Contractor shall carry out repairs and maintenance in parent materials used for the existing base and surfacing of the road being used.

**906 PASSAGE OF TRAFFIC THROUGH THE WORKS**

The Contractor shall arrange for passage of traffic through the works during construction whenever it is not practicable to make deviations.

Any damage caused by passing traffic through the works shall be made good at the contractor's own cost.

**907 SIGNS, BARRIERS AND LIGHTS**

Contractor shall provide signs, barriers and lights as shown in the drawing in Book of Drawings at the locations where the traffic is being carried off the existing road to the deviation and back again to existing road. The Contractor shall provide ramps and carry out any other measures as instructed by the Engineer to safely carry traffic from the road to deviation.

Contrary to what has been specified in this clause the road signs provided shall be fully reflectorized and in conformity with clause 9.1 of the "Manual for Traffic Signs in Kenya Part II".

**909 ASSISTANCE TO PUBLIC**

In addition to provision of clause 909, Contractor shall maintain close liaison with the relevant authorities to clear any broken down or accident vehicles from the deviations and the main road, in order to maintain smooth and safe flow of the traffic. **Further, the Contractor shall provide a traffic management plan to be approved by the Engineer before the commencement of any construction works and execute the same, to the satisfaction of the Engineer, during the entire period of project implementation. A draft traffic management plan shall be submitted with Bid.**

**MEASUREMENT AND PAYMENT****Construct Deviation****Road Deviation**

The Contractor shall be paid only 50% of the rate for this when he completes deviation road to the satisfaction of the Engineer. The balance shall be paid in equal monthly instalments over the contract period, as he satisfactorily maintains the deviation (as per clause 904 and 905 above) when it is in operation.

Where existing neighboring road has been used as deviation, payment shall be by the kilometer rate and shall include the cost of repairs and maintenance of the road carried out in parent base and subbase materials.

**Deviation using Pipe Culverts**

The Contractor shall be paid only 50% of the rate for this when he completes deviation to the satisfaction of the Engineer. The balance shall be paid in equal monthly instalments over the contract period, as he satisfactorily maintains the deviation when it is in operation. The Contractor shall be paid full amount when the bridge under construction will be in use.

**Maintain existing road**

Asphalt Concrete or gravel for maintaining the existing road shall be measured by the cubic meter placed and compacted upon the road

**Passage of traffic through the works**

Payment shall be made on Lump Sum basis.

**Assistance to Public**

The Contractor will be deemed to have included cost of this item in other items and no separate payment shall be made.

## SECTION 10 – GRADING AND GRAVELLING

### 1001 GENERAL

Grading covers the works involved in the reinstatement of the road carriageway to the camber by removing the high points and filling up gullies, corrugations and wheel ruts to restore smooth running surface. Graveling consists of excavation, loading, hauling, spreading, watering and compaction of gravel or softstone wearing course material on the formation of the road carriageway.

#### Ditch and Shoulder grading

The activity consists of cutting of a V – ditch and reinstating or reforming of the shoulders of road using either Towed or Motor grader.

#### Carriageway grading

##### **(i) Light grading**

This consists of trimming of the carriageway to control roughness and corrugations using either a towed grader or a motorized grader.

##### **(ii) Heavy grading**

This consists of scarifying the existing carriageway surface, cutting high spots and moving materials to fill potholes, corrugations and wheel ruts and reshaping of the surface to the specified camber, using either a towed grader or a motorized grader. All loose rocks, roots, grasses shall be removed and disposed well clear off the drains.

Heavy grading will be considered if 70% of the road has potholes, corrugations and wheel ruts of over 200mm deep.

The material shall be bladed toward the center of the road starting from both edges until the specified camber is achieved.

### 1002 MATERIALS

Gravel shall include lateritic gravel, quartzitic gravel, calcareous gravel, decomposed rock, soft stone/quarry waste material, clayey sand and crushed rock.

**MATERIAL REQUIREMENTS**

Gravel material shall conform to the requirements given below:

GRADING REQUIREMENTS AFTER COMPACTION		
Sieve (mm)	% by weight passing	
40	100	
28	95 – 100	
20	85 – 100	
14	65 – 100	
10	55 – 100	
5	35 – 92	
2	23 – 77	
1	18 – 62	
0.425	14 – 50	
0.075	10 - 40	
PLASTICITY INDEX REQUIREMENTS PI		
Zone	Min	Max
WET	5	15
DRY	10	25

BEARING STRENGTH REQUIREMENTS		
Traffic Commercial VPD	CBR	DCP Equivalent mm/Blow
Greater than 15	20	11
Less than 15	15	14
CBR at 95% at MDD, Modified AASHTO and 4 days soak		
Lower quality material (CBR 15) may be accepted if no better material can be found		

NB: Wet Zone – mean annual rainfall greater than 500mm  
Dry Zone – mean annual rainfall less than 500mm



## **SECTION 11 – SHOULDERS TO PAVEMENT**

### **1101 GENERAL**

Shoulders shall be constructed in accordance with guidelines given in 1102 and as directed by the Engineer.

For sections where shoulders are extremely low and requires fill material before the shoulder is reconstructed, the construction of fill embankment shall be in accordance with Section 5 of this specification.

### **1102 MATERIAL FOR CONSTRUCTION OF SHOULDERS**

The shoulders shall be 1.0m wide both sides and shall be formed of 150mm thick well compacted soft stone material and topsoiled with red coffee soil and planted with grass.

Low shoulder shall be reconstructed by cutting benches, filling and compacting approved fill material to form the formation to the shoulders.

Shoulder reconstruction shall be same in all sections including the slip roads.

### **1105 SURFACE TREATMENT OF SHOULDERS**

The shoulders shall be planted with creeping type kikuyu grass.

### **1106 MEASUREMENT AND PAYMENT**

Payment for shoulder construction shall be in accordance with the relevant clauses in sections 11, 12, 14, 15 and 23 of the relevant Specifications. Payment for fill material on shoulder shall be in accordance with Section 5 of this specification.

## SECTION 12 - NATURAL MATERIAL SUBBASE AND BASE

### 1201 GENERAL

Where instructed by the Engineer, the Contractor shall undertake repairs, widening and reprocessing to the existing carriageway and shoulders in accordance with sections 12 and 14 of the Special Specifications.

#### a) Areas to be scarified and reprocessed

The contractor will scarify, add new material and reprocess sections as determined by the Engineer.

#### b) Pavement repairs

The Contractor will carry out repairs to base and subbase as directed by the Engineer and according to Specifications given in Sections 12 and 14 of the Standard Specifications.

#### c) Pavement widening

The Contractor shall, as directed by the Engineer, bench and compact the subgrade to 100% MDD (AASHTO T99), provide lay and compact material for subbase and base as directed by the Engineer and in accordance with Sections 5 and 12 of the Standard Specifications.

### 1203 MATERIAL REQUIREMENTS

Natural materials for base and subbase shall conform to the specifications given in Section 12 of the Standard Specifications for Road and Bridge Construction for cement and lime improved base and subbase.

### 1209 MEASUREMENT AND PAYMENT

Natural material for subbase and base shall be measured by the cubic metre placed and compacted upon the road calculated as the product of the compacted sectional area laid and the length.

### 1210 HAND PACKED STONE

Hand packed stone base is a layer of hand laid stone of defined size and durable in nature, laid in a manner such that when proof rolled and compacted it forms a stable and dense matrix as a road base.

#### a) Material for Hand Packed Stone Base

This shall consist of durable stone with nominal base dimensions of 75 mm square and minimum height of 150 mm or when compacted to give a layer of 150 mm. The stone shall be class C with the following requirements:

**LAA 45 max**

**ACV**            **32 max**  
**SSS**            **12 max**  
**FI**                **30 max**  
**CR**                **60min.**  
**Water absorption**    **2% MAX**

It shall be free from foreign matter. The fines passing 0.425 mm sieve shall be **NONPLASTIC**

**b) Laying**

The stone shall be laid by hand closely together. The stone shall be carefully bedded and tightly wedged with suitable spalls. The base of the stone shall alternate with the apex in all directions or as directed by the Engineer. The layer shall be proof rolled with a loaded scrapper or truck with a minimum axle load of 8 tonnes in the presence of the Engineer who shall approve of its stability before compaction.

**c) Compaction**

This shall be by a steel wheeled roller of at least five tonnes per metre width of roll. It shall consist of four static runs or until there is no movement under the roller. There shall follow vibratory compaction until an average dry density of 85% minimum of specific gravity of stone has been achieved. No result shall be below 82% of specific gravity. The surface of the compacted layer shall then be levelled by quarry dust (0/6 mm). The dust shall have the following specifications:

The stone shall be class C

**Grading**

Sieve Size	% Passing
10	100
6.3	90-100
4	75-95
2	50-70
1	33-50
0.425	20-33
0.300	16-28
0.150	10-20
0.075	6-12

The dust shall be free from foreign matter and fines passing 0.425 mm sieve shall be **NON-PLASTIC**. The maximum layer shall be 40 mm or as directed by the Engineer

**d) Measurement and Payment**

Payment shall be by the cubic metre laid (m<sup>3</sup>). Measurement of volume shall be determined as the product of length and compacted thickness laid. The rate quoted for this item should include the cost for laying the levelling quarry dust layer, as no extra payment shall be made for this layer.

**1211 REPROCESSING EXISTING PAVEMENT LAYERS**

**(a) General**

The existing surfacing and the base shall be reprocessed with additional material and the composite mixture shall be compacted to form the subbase layer.

Before commencement of the work the Contractor shall propose plants and equipments he proposes to use for this activity.

The Contractor after approval of his proposal shall carry out test section in accordance with Section 3 of the Standard Specifications.

(b) The existing surfacing and base course shall be broken up to specified depth and reprocessed in place, where required. The underlying layers shall not be damaged, and material from one layer may normally not be mixed with that of another layer. Where unauthorized mixing occurs or where the material is contaminated in any way by the actions of the Contractor, and the contaminated material does not meet the specified requirements of for the particular layer, he shall remove such material and replace it with other approved material, all at his own expense.

(c) Any mixture composition of the new layer must not contain more than 30% of the bituminous material by volume. The mixture must not contain pieces of bound bituminous material larger than 37.5mm, and any such material shall be removed at the Contractor's cost.

- (d) The requirements for imported material used in the respective pavement layers shall comply with the limitations, norms, sizes and strengths specified in the Standard Specifications clause 1203(b) and (d) and shall be worked as per Section 14 of the Standard Specification.
- (e) Material reworked in-situ or that obtained from existing pavement is not expected to comply with the material requirements but the reworking should achieve the specified requirements.
- (f) Where the thickness of any existing pavement layer requires to be supplemented within reprocessing and the thickness of the additional material after compaction will be less than 100mm, the existing layer shall be scarified to a depth that will give a layer thickness of at least 100mm after compacting the loosened existing and the additional material.

### **Controlling the Reworked Depth**

The Contractor shall submit a proven method to method to control the depth of excavation, or layer to be reworked, to the Engineer for approval. The Engineer may order a trial section to be reprocessed before any major length of the road is rehabilitated.

### **Excavations**

Excavations in the pavement shall be kept dry. In the event of water penetrating the underlying layers, construction of the consecutive layers shall be postponed until the underlying layers are dry enough to accommodate the construction plant without deforming or otherwise showing distress.

Step construction shall be carried out per layer at the joint when excavating, both longitudinally (if appropriate) and perpendicular to the direction of travel. The step width shall be 500mm perpendicular to the direction of travel, and 150mm long longitudinally, unless otherwise instructed by the Engineer.

Special care shall be taken when compacting the new material at the joint, ensuring that the specified density is achieved.

### **Measurement and Payment**

(a) Item: In-situ reprocessing of existing pavement layers as subbase compacted to specified density (95% MDD AASHTO T180) and thickness.

Unit: M<sup>3</sup>

The tendered rate shall include full compensation for breaking up the existing pavement layer to specified depth, breaking down and preparing the material and the spreading and mixing in of any additional material

(b) Item: The addition of extra gravel to subbase.

Unit: M<sup>3</sup>

The tendered rate shall include full compensation for procuring and addition of the material to the in-situ scarified layers and the transportation of the material over unlimited free-haul

distance. The tendered rates will also include full compensation for prospecting for materials and any payments necessary to acquire the specified quality material.

- (c) Excavation of existing bituminous pavement materials including unlimited free-haul.

Unit: M<sup>3</sup>

The tendered rates shall include full compensation for excavating the existing bituminous material from the pavement layers and for loading, transporting the material for unlimited free-haul, off-loading and disposing of the materials as specified.

- (d) Excavation of the existing pavement

Unit: M<sup>3</sup>

The tendered rate shall include full compensation for excavating the existing material from the pavement layers and for loading, transporting the material for unlimited free-haul distance, off-loading and disposing of the material as specified.

Payment will only be made for breaking up and excavating existing pavement layers to the specified depth if the material is to be removed to spoil.

## SECTION 15 - BITUMINOUS SURFACE TREATMENTS

### 1501B PREPARATION OF SURFACE

In addition to requirements of Clause 1503B of the Standard Specifications, the contractor shall prepare and Repair Cracks, Edges, Potholes and Other Failures as follows: ~

a) **Cracks 3.0mm or less in width**

The entire crack area shall be cleaned by brushing with a wire brush and then blowing with a compressed air jet and the crack sealed with 80/100 cutback bitumen using a pouring pot or pressure lance and hand squeegee. The surface shall then be dusted with sand or crushed dust.

b) **Cracks greater than 3.0mm in width**

Before these cracks are filled a steel wire brush or router shall be used to clean them and then a compressed air jet shall be used to clean and remove any foreign or loose material in the crack until the entire crack area is clean.

When the crack and surrounding area have been thoroughly cleaned, dry sand shall be forced into the crack until it is sealed in the manner specified for cracks less than 3.0mm width.

c) **Potholes, edges and other repair areas**

Where instructed, the Contractor shall prepare areas for the repair of potholes, road edges and other repair areas by excavating off unsuitable or failed material and debris, trimming off excavated edges, cleaning and compacting the resulting surfaces and applying MC 30 or MC 70 cut-back bitumen prime coat at a rate of 0.8-1.2 litres/m<sup>2</sup>, all as directed by the Engineer. Measurement and payment shall be made under the relevant item of Bill No 15. Where the surface repair on potholes and edges are to be carried out, Asphalt Concrete Type I (0/14 gradation) shall be used. Bituminous material for repair of failures and other repair areas shall be paid for under the relevant item of Bill No 16

## **PART B - PRIME COAT**

### **1502B MATERIALS FOR PRIME COAT AND TACK COAT.**

For prime coat, the binder shall be a medium-curing cutback MC 70 unless otherwise directed by the Engineer.

The rate of spray of bituminous prime coat refers to the gross volume of the cutback bitumen, that is to say the volume of the bitumen plus diluents.

Prime coat shall be applied to gravel areas that are to receive bituminous mixes as directed by the Engineer.

The tack coat shall consist of bitumen emulsion KI-60 unless otherwise directed by the Engineer.

The rates of spray of the binder shall be as instructed by the Engineer and shall generally be within the range 0.8-1.2 litres/square metre.

### **1511C MEASUREMENT AND PAYMENT**

#### **(a) Seal coat**

Seal coats shall be measured by the litre, for each type of bituminous binder for each seal coat, calculated as the product of the area in square metres sprayed and the rate of application in litres/square metres, corrected to 15.6 °C

## **SECTION 16 - BITUMINOUS MIX BASES, BINDER COURSES AND WEARING COURSES**

This section covers different types of bituminous mixes for base and surface (wearing and binder courses) and is divided into the following parts: -

Part A            General

Part B            Asphalt Concrete for carriageway

### **PART A – GENERAL**

#### **1601A SCOPE OF PART A**

Part A comprises all the general requirements for bituminous mixes, which apply to Part B as well.

## 1602A REQUIREMENTS FROM OTHER SECTIONS

The following sections of this Specification apply to Part B of this section and shall be read in conjunction therewith:-

Section 2	Materials and Testing of Materials
Section 3	Setting Out and Tolerances
Section 6	Quarries, Borrow Pits, Stockpile and Spoil Areas
Section 15	Bituminous Surface Treatments and Surface Dressing

## 1603A CONSTRUCTION PLANT

### (a) General

The Contractor shall submit to the Engineer in accordance with Section 1 of its Specification, full details of the construction plant he proposes to use and the procedures he proposes to adopt for carrying out the permanent Works.

The Engineer shall have access at all times to construction plant for the purposes of inspection. The Contractor shall carry out regular calibration checks in the presence of the Engineer and shall correct forthwith any faults that are found.

All construction plant used in the mixing, laying and compacting of bituminous mixes shall be of adequate rated capacity, in good working condition, and shall be acceptable to the Engineer. Obsolete or worn-out plant will not be allowed on the work.

### (b) Mixing Plant

Bituminous materials shall be mixed in a plant complying with ASTM Designation D995 and shall be located on the Site unless otherwise agreed by the Engineer. It shall be equipped with at least three bins for the storage of heated aggregates and a separate bin for filler. All bins shall be covered to prevent the ingress of moisture.

The plant may be either the batch-mix type or the continuous-mix type and shall be capable of regulating the composition of the mixture to within the tolerances specified in Clause 1614A of this Specification.

The bitumen tank shall be capable of maintaining its contents at the specified temperature within a tolerance of 5°C and a fixed thermometer easily read from outside the tank. Any bitumen that has been heated above 180°C or has suffered carbonisation from prolonged heating shall be removed from the plant and disposed of.

### (c) Laying Plant

Bituminous materials shall be laid by a self-propelled spreader finisher equipped



with a hopper, delivery augers and a heated adjustable vibrating screed. It shall be capable of laying bituminous materials with no segregation, dragging, burning or other defects and within the specified level and surface regularity tolerance. Delivery augers shall terminate not more than 200mm from the edge plates.

(d) **Compaction Plant**

The Contractor shall provide sufficient rollers of adequate size and weight to achieve the specified compaction. Prior to commencing the laying of bituminous mixes in the permanent Works the Contractor shall carry out site trials in accordance with Section 2 of this Specification to demonstrate the adequacy of his plant and to determine the optimum method of use and sequence of operation of the rollers.

It is important to achieve as high a density as possible at the time of construction and it is expected that vibrating rollers will be required to produce the best results. However, it is essential that thorough pre-construction trials are carried out to ensure that:-

- (a) The roller is set up to have the optimum amplitude and frequency of vibration for the particular material being laid
- (b) That the roller does not cause breakdown of the aggregate particles.

(b) That the optimum compaction temperatures are established which allow compaction without causing ripple effects or other distortions of the surfacing.

**1604A PREPARATION OF SURFACE**

Immediately before placing the bituminous mix in the pavement, the existing surface shall be cleaned of all material and foreign matter with mechanical brooms or by other approved methods. The debris shall be deposited well clear of the surface to be covered.

Any defect of the surface shall be made good and no bituminous mix shall be laid until the Engineer has approved the surface.

A tack coat shall be applied in accordance with Section 15 of this Specification. If the Engineer considers a tack coat is required prior to laying the bituminous mix or between layers of the bituminous mix, due solely to the Contractor's method of working, then such tack coat shall be at the Contractor's expense.

**1605A DESIGN AND WORKING MIXES**

At least two months prior to commencing work using a bituminous mix, the Contractor shall, having demonstrated that he can produce aggregates meeting the grading requirements of the Specification, submit samples of each constituent of the mix to the Engineer. The Engineer will then carry out laboratory tests in

order to decide upon the proportion of each constituent of the initial design mix or mixes to be used for site trials to be carried out in accordance with Clause 1606A of this Specification.

Should the Engineer conclude from the site trials that the mix proportion or aggregate grading are to be changed, the Contractor shall submit further samples of the constituents and carry out further site trials all as directed by the Engineer.

The Engineer may instruct the alteration of the composition of the -75 micron fraction of the aggregates by the addition or substitution of mineral filler. The Engineer may also instruct the alteration of all or part of the -6.3mm fraction of the aggregates by the addition or substitution of natural sand.

The Contractor shall make the necessary adjustments to his plant to enable the revised mix to be produced.

Following laboratory and site trials the Engineer will determine the proportions of the working mix and the Contractor shall maintain this composition within the tolerances given in Clause 1614A.

Should any changes occur in the nature or source of the constituent materials, the Contractor shall advise the Engineer accordingly. The procedure set out above shall be followed in establishing the new mix design.

## **1606A**

### **SITE TRIALS**

Full scale laying and compaction site trials shall be carried out by the Contractor on all asphalt pavement materials proposed for the Works using the construction plant and methods proposed by the Contractor for constructing the Works. The trials shall be carried out with the agreement, and in the presence of the Engineer, at a location approved by the Engineer.

The trials shall be carried out to: -

- a) Test materials, designed in the laboratory, so that a workable mix that satisfies the specification requirements can be selected.
- b) To enable the Contractor to demonstrate the suitability of his mixing and compaction equipment to provide and compact the material to the specified density and to confirm that the other specified requirements of the completed asphalt pavement layer can be achieved.

Each trial area shall be at least 100 metres long and to the full construction width and depth for the material. It may form part of the Works provided it complies with this Specification. Any areas that do not comply with this Specification shall be removed.

The Contractor shall allow in his programme for conducting site trials and for carrying out the appropriate tests on them. The trial on any pavement layer shall be undertaken at least 21 days ahead of the Contractor proposing to commence full-scale work on that layer.

The Contractor shall compact each section of trial over the range of compactive effort the Contractor is proposing and the following data shall be recorded for each level of compactive effort at each site trial: -

- i. The composition and grading of the material including the bitumen content and type and grade of bitumen used.
- ii. The moisture content of aggregate in the asphalt plant hot bins.
- iii. The temperature of the bitumen and aggregate immediately prior to entering the mixer, the temperature of the mix on discharge from the mixer and the temperature of the mix on commencement of laying, on commencement of compaction and on completion of compaction. The temperature of the mixture is to be measured in accordance with BS 598, Part 3, Appendix A.
- iv. The type, size, mass, width of roll, number of wheels, wheel load, tyre pressures, frequency of vibration and the number of passes of the compaction equipment, as appropriate for the type of roller.
- v. The target voids and other target properties of the mix together with the results of the laboratory tests on the mix.
- vi. The density and voids achieved.
- vii. The compacted thickness of the layer.
- viii. Any other relevant information as directed by the Engineer.

At least eight sets of tests shall be made by the Contractor and the Engineer on each 100 metres of trial for each level of compactive effort and provided all eight sets of results over

the range of compactive effort proposed by the Contractor meet the specified requirements for the material then the site trial shall be deemed successful. The above data recorded in the trial shall become the agreed basis on which the particular material shall be provided and processed to achieve the specified requirements.

#### **1607A MIXING OF AGGREGATES AND BITUMEN**

The bitumen shall be heated so that it can be distributed uniformly and care shall be taken not to overheat it. The temperature shall never exceed 170<sup>o</sup> C for 80/100-penetration grade bitumen.

The aggregates shall be dried and heated so that they are mixed at the following temperatures: -

125-165<sup>o</sup>C when 80/100 bitumen is used

The dried aggregates shall be combined in the mixer in the amount of each fraction instructed by the Engineer and the bitumen shall then be introduced into the mixer in the amount specified. The materials shall then be mixed until a complete and uniform coating of the aggregate is obtained.

The mixing time shall be the shortest required to obtain a uniform mix and

thorough coating. The wet mixing time shall be determined by the Contractor and agreed by the Engineer for each plant and for each type of aggregate used. It shall normally not exceed 60 seconds.

**1608A TRANSPORTING THE MIXTURE**

The bituminous mix shall be kept free of contamination and segregation during transportation. Each load shall be covered with canvas or similar covering to protect it from the weather and dust.

**1609A LAYING THE MIXTURE**

Immediately after the surface has been prepared and approved, the mixture shall be spread to line and level by the laying plant without segregation and dragging.

The mixture shall be placed in widths of one traffic lane at a time, unless otherwise agreed by the Engineer. The compacted thickness of any layer shall be at least 2.5 times the maximum size of the aggregate for wearing course and at least 2 times for binder course. The minimum thickness shall be 25mm.

Only on areas where irregularities or unavoidable obstacles make the use of mechanical laying impracticable, may the mixture be spread and compacted by hand.

**1610A COMPACTION**

Immediately after the bituminous mixture has been spread, it shall be thoroughly and uniformly compacted by rolling.

The layer shall be rolled when the mixture is in such a condition that rolling does not cause undue displacement or shoving.

The number, weight and type of rollers furnished shall be sufficient to obtain the required compaction while the mixture is in a workable condition. The sequence of rolling operations shall be as agreed with the Engineer and proved during site trials. Initial rolling with steel tandem or three-wheeled roller shall follow the laying plant as closely as possible. The rollers shall be operated with the drive roll nearest the laying plant, at a slow and uniform speed (not exceeding 5 Km/Hr).

Rolling shall normally commence from the outer edge and proceed longitudinally parallel to the centreline, each trip overlapping one half of the roller width. On super elevated curves, rolling shall begin at the low side and progress to the high side. Where laying is carried out in lanes care must be taken to prevent water entrapment.

Intermediate rolling with a pneumatic-tyred or vibratory roller shall follow immediately. Final rolling with a steel-wheeled roller shall be used to eliminate marks from previous rolling.

To prevent adhesion of the mixture to the rollers, the wheels shall be kept lightly moistened with water.

In areas too small for the roller, a vibrating plate compactor or a hand tamper shall be used to achieve the specified compaction.

#### **1611A FINISHING, JOINTS AND EDGES**

Any mixture that becomes loose and broken, mixed with dirt or foreign matter or is in any way defective, shall be removed and replaced with fresh hot mixture, which shall be compacted to conform to the surrounding area.

Spreading of the mixture shall be as continuous as possible. Transverse joints shall be formed by cutting neatly in a straight line across the previous run to expose the full depth of the course. The vertical face so formed shall be painted lightly with hot 80/100 penetration grade bitumen just before the additional mixture is placed against it.

Longitudinal joints shall be rolled directly behind the paving operation. The first lane shall be placed true to line and level and have an approximately vertical face. The mixture placed in the abutting lane shall then be tightly crowded against the face of the previously placed lane. The paver shall be positioned to spread material overlapping the joint face by 20-30mm. Before rolling, the excess mixture shall be raked off and discarded.

When the abutting lane is not placed in the same day, or the joint is destroyed by traffic, the edge of the lane shall be cut back as necessary, trimmed to line and painted lightly with hot 80/100 penetration grade bitumen just before the abutting lane is placed.

Any fresh mixture spread accidentally on the existing work at a joint shall be carefully removed by brooming it back on to uncompacted work, so as to avoid formation of irregularities at the joint. The finish at joints shall comply with the surface requirements and shall present the same uniformity of finish, texture and density as other sections of the work.

The edges of the course shall be rolled concurrently with or immediately after the longitudinal joint. In rolling the edges, roller wheels shall extend 50 to 100mm beyond the edge.

#### **1612A SAMPLING AND TESTING OF BITUMINOUS MIXTURES**

The sampling of bituminous mixtures shall be carried out in accordance with AASHTO T168 (ASTM Designation D979).

#### **1613A QUALITY CONTROL TESTING**

During mixing and laying of bituminous mixtures, control tests on the constituents and on the mixed material shall be carried out in accordance with Clause 1612A and Section 2 of this Specification.

If the results of any tests show that any of the constituent materials fail to comply with this Specification, the Contractor shall carry out whatever changes may be necessary to the materials or the source of supply to ensure compliance.

If the results of more than one test in ten on the mixed material show that the material fails to comply with this Specification, laying shall forthwith cease until the reason for the failure has been found and corrected. The Contractor shall remove any faulty material laid and replace it with material complying with this Specification all at his own expense.

#### **1614A TOLERANCES**

Surfacing courses and base shall be constructed within the geometric tolerances specified in Section 3 of this Specification.

The Contractor shall maintain the composition of the mixture as determined from the laboratory and site trials within the following tolerances, per single test: -

Bitumen Content	0.3% (by total weight of total mix)
Passing 10mm sieve and larger sieves	6% (by total weight of dry aggregate including mineral filler)
Passing sieves between 10mm and 1.0mm sieves	4% (by total weight of dry aggregate including mineral filler)
Passing sieves between 1.0mm and 0.075mm sieve	3% (by total weight of dry aggregate including mineral filler)
Passing 0.075mm sieve	2% (by total weight of dry aggregate including mineral filler)

The average amount of bitumen in any length of any layer, calculated as the product of the bitumen contents obtained from single tests and the weight of mixture represented by each test, shall not be less than the amount ordered.

The average amount of bitumen for each day's production calculated from the checked weights of mixes shall not be less than the amount ordered.

The average amount of bitumen in any length of any layer, calculated as the product of the bitumen contents obtained from single tests and the weight of mixture represented by each test, shall not be less than the amount ordered.

The average amount of bitumen for each day's production calculated from the checked weights of mixes shall not be less than the amount ordered.

The final average overall width of the upper surface of a bituminous mix layer measured at six equidistant points over a length of 100m shall be at least equal to the width specified. At no point shall the distance between the centreline of the road and the edge of the upper surface of a bituminous mix layer be narrower than that specified by more than 13mm.

#### **1615A MEASUREMENT AND PAYMENT**

No separate measurement and payment shall be made for complying with the

requirements of Clauses 1601A to 1614A inclusive and the Contractor shall be deemed to have allowed in his rates in Parts B and C of Section 16 of this Specification for the costs of complying with the requirements of Part A of Section 16 of this Specification

**PART B - ASPHALT CONCRETE FOR SURFACING**

**1601B DEFINITION**

Asphalt concrete means a thoroughly controlled, hot-mixed, hot-laid, plant mixture of well-graded dried aggregate and penetration grade bitumen, which, when compacted forms a dense material.

A distinction is drawn between asphalt concrete Type I (High Stability) and asphalt concrete Type II (Flexible). The asphalt concrete type to be used will be Type I.

**1602B MATERIALS FOR ASPHALT CONCRETE TYPE I**

**a) Type of bituminous material**

The type of material to be used on severe sites will be of the continuously graded type similar to Asphaltic Concrete or Close Graded Macadam. It is essential that these materials are sealed with a single or double surface dressing or a Cape seal.

**b) Penetration Grade Bitumen**

Bitumen shall be 80/100 penetration grade since material is being laid at an altitude of more than 2,500m.

**c) Aggregate**

Coarse aggregate (retained on a 6.3mm sieve) shall consist of crushed stone free from clay, silt, organic matter and other deleterious substances. The aggregate class will be specified in the Special Specification and it shall comply with the requirements given in Table 16B-1(b). The grading for 0/20 mm for carriageway and 0/14mm for shoulders for binder course is as specified below:

Sieve size	0/20	0/14
28	100	~
20	90-100	100
14	75-95	90-100
10	60-82	70-90
6.3	47-68	52-75
4	37-57	40-60
2	25-43	30-45
1	18-32	20-35
0.425	11-22	12-24
0.300	9-17	10-20

0.150	5-12	6-14
0.075	3-7	4-8

**TABLE 16B-1(b) - REQUIREMENTS FOR COARSE AGGREGATE**

<b>Coarse Aggregate (Retained on a 6.3mm Sieve)</b>	
<b>Test</b>	<b>Maximum Value</b>
LAA	30
ACV	25
SSS	12
FI	25

Fine aggregate (passing a 6.3mm sieve) shall be free from clay, silt, organic and other deleterious matter and shall be non-plastic. Unless otherwise specified in the Special Specification it shall consist of entirely crushed rock produced from stone having a Los Angeles Abrasion of not more than 40. The Sand Equivalent of the fine aggregate shall not be less than 40 and the SSS not more than 12.

**b) Mineral Filler**

Mineral Filler shall consist of ordinary Portland Cement 42.5 Grade

**1603B GRADING REQUIREMENTS**

The grading of the mixture of coarse and fine aggregate shall be within and approximately parallel to the grading envelopes given in Table 16B-1(b), for 0/14mm as specified for binder course, as described below.

**GRADING REQUIREMENTS**

To arrive at a suitable design it is necessary to investigate a number of gradings so that a workable mix, which also retains a minimum of 3 % voids at refusal density, is identified.



The largest particle size used should not be more than 25mm so that the requirements of the Marshall test method can be complied with.

Although the complete range of nominal maximum particle sizes is shown in the Tables, the total thickness of material laid should not be more than 75mm.

## 1604B

### REQUIREMENTS FOR ASPHALT CONCRETE TYPE 1

The mixture shall comply with the requirements given in Table 16B-2 as specified in the Specification. In addition, minimum Marshall Stability for 2 x 75 blows shall be 9 kN and maximum 18 kN and at compaction to refusal shall have 3% VIM.

The proportion, by weight of total mixture, of bitumen shall be 5.0 – 6.5 % for 0/14 mm and 4.5 – 6.5 % for 0/20mm. This shall be termed the nominal binder content. The binder content of the working mix will be instructed by the Engineer following laboratory and site trials.

In order to determine the suitability of a coarse aggregate source a Marshall test programme shall be carried out. It will be advantageous to use a crushed rock which is known from past experience to give good results in this test procedure. A grading conforming to the Type I Binder Course detailed in Table 16B-1(a) 0/20 of this Specification should be tested (but with 100% passing the 25mm sieve) and it shall meet the requirements of Table 16B-2 of this Specification.

Having established the suitability of the aggregate source several gradings shall be tested in the laboratory, including that used for the Marshall test, to establish relationships between bitumen content and VIM at refusal density. For each mix, samples will be made up to a range of bitumen contents and compacted to refusal using a gyratory compactor and a vibratory hammer in accordance with the procedure described in BS 598 (Part 104 : 1989), with one revision.

It should first be confirmed that compaction on one face of the sample gives the same refusal density as when the same compaction cycle is applied to both faces of the same sample. The procedure, which gives the highest density, must be used.

From the bitumen content-VIM relationship it will be possible to identify a bitumen content which corresponds to a VIM of 3 - 7%. If it is considered that the workability of the mix may be difficult then compaction trials should be undertaken. It is advisable to establish two or more gradings for compaction trials.

The mixes identified for compaction trials should be manufactured to the laboratory design bitumen content and to two other bitumen contents of +0.5% and +1% additional bitumen. Cores will be cut to determine the density of the compacted material, having completed this the core will then be reheated to 145+/-5°C in the appropriate mould and compacted to refusal in the vibrating hammer test. To be acceptable the cores cut from the compaction trial must have a density equivalent to at least 95% of refusal density.

The compaction trials will identify a workable mix which can be made to a bitumen content which gives 3% VIM at refusal density.

**1605B MIXING AND LAYING HEAVY DUTY ASPHALT**

The temperature of the bitumen and aggregates when mixed shall be 110+/-3°C above the softening point (R&B) of the bitumen.

Compaction should commence as soon as the mix can support the roller without undue displacement of material and completed before the temperature of the mix falls below 90°C.

The minimum thickness of individual layers should be as follows:-

- |    |                    |      |
|----|--------------------|------|
| a) | For the 37.5mm mix | 65mm |
| b) | For the 25.0mm mix | 60mm |
| c) | For the 19.0mm mix | 50mm |
| d) | For the 12.5mm mix | 40mm |

**1606B COMPACTION**

Rolling shall be continued until the voids measured in the completed layer are in accordance with the requirement for a minimum density of 98% of Marshall optimum, or, a minimum mean value of 95% of refusal density (no value less than 93%) as appropriate.

**1607B MEASUREMENT AND PAYMENT**

- a) Item : Asphalt Concrete  
Unit : m<sup>3</sup> of Asphalt Concrete Used

Asphalt concrete shall be measured by the cubic metre compacted on the road calculated as the product of the length instructed to be laid and the compacted cross-sectional area shown on the Drawings or instructed by the Engineer.

The rate for asphalt concrete shall include for the cost of providing, transporting, laying and compacting the mix with the nominal binder content and complying with the requirements of Parts A and B of Section 16 of this Specification.

**SECTION 17 - CONCRETE WORKS**

**1703 MATERIALS FOR CONCRETE**

This work shall consist of placing selected approved material of 250mm minimum diameter on the foundation put after excavation to receive levelling concrete in accordance with these specifications and in conformity with the lines, grades and cross sections shown on the Drawings as directed by the Engineer.

- (a) **Materials**

Selected rock: The selected rock builders to be placed for this work shall

be hard, sound, durable quarry stones as approved by the Engineer. Samples of the stone to be used shall be submitted to and approved by the Engineer before any stone is placed.  
The maximum size of the stone boulders shall be 300mm.

(b) **Construction Method**

After completion of the structural excavation the surface of the loose soil shall be levelled and compacted. Then the stone of the above sizes shall be placed in one layer of 250mm over the compacted bed where the bottom slab will rest. Coarse sand shall be spread to fill up the voids in the stone boulders, and compaction with vibratory compactors should be performed to make this layer dense whereon a concrete of levelling course shall be placed.

(c) **Measurement and payment**

Measurement for the bedding materials shall be made in cubic metres for the completed and accepted work, measured from the dimension shown on the Drawings, unless otherwise directed by the Engineer.

Payment for the bedding Materials for Levelling Concrete Works shall be full compensation for furnishing and placing all materials, all labour equipment, tools and all other items necessary for proper completion of the work in accordance with the Drawings and specifications and as directed by the Engineer.

**1703(A) LEVELLING CONCRETE (CLASS 15/20) FOR BOTTOM SLAB INCLUSIVE OF COST OF FORM WORKS**

This work shall consist of placing and levelling lean concrete class 15/20 over the prepared bed of stone boulders in the foundation for bottom slab and wingwalls in accordance with these specifications and which conformity with the lines, grades, thickness and typical cross-sections shown on the drawings unless otherwise directed by the Engineer.

(a) **Materials for Levelling Concrete**

Requirement for the concrete class 15/20 is specified as follows:-

Design compressive strength (28) days : 15N/mm<sup>2</sup>

Maximum size of coarse aggregate : 20mm

Maximum cement content : 300 kg/m<sup>3</sup>.

Maximum water/cement ration of 50% with slump of 80mm.

(b) **Construction Method**

The bed of stone boulders upon which the levelling concrete will be placed shall be smooth, compacted and true to the grades and cross-section shall be set to the required lines and grades.

1.2 (c) **Measurement and payment**

Measurement for levelling concrete (class 15/20) shall be made in cubic metres completed and accepted levelling concrete work measured in place which is done in accordance with the Drawings and the Specifications.

Payment for this work shall be the full compensation for furnishing and placing all materials, labour, equipment and tools, and other incidentals to Specifications and as directed by the Engineer.

Pay item No. 17/02 Levelling Concrete Works (Class 15/20) for Box Culvert and wingwalls inclusive of Cost of Form works.

**1703 (C) FORMWORK FOR CULVERT WALLS**

This work shall consist of all temporary moulds for forming the concrete for culvert walls and slabs together with all temporary construction required for their support. Unless otherwise directed by the Engineer all formworks shall be removed on completion of the walls and slabs.

(a) **Materials**

Forms shall be made of wood or metal and shall conform to the shape, lines and dimensions shown on the Drawings.

All timber shall be free from holes, loose material, knots, cracks, splits and warps or other defects affecting the strength or appearance of the finished structure.

Release Agents – Release agents shall be either neat oils containing a surface activating agent, cream emulsions, or chemical agents to be approved by the Engineer.

(b) **Construction Method**

(i) **Formworks**

Formworks shall be designed to carry the maximum loads that may be imposed, and so be rigidly constructed as to prevent deformation due to load, drying and wetting, vibration and other causes. After forms have been set in correct location, they shall be inspected and approved by the Engineer before the concrete is placed.

If requested, the contractor shall submit to the Engineer working drawings of the forms and also, if requested, calculations to certify the rigidity of the forms.

**1703(D) CONCRETE WORKS (CLASS 25/20) OF CULVERT WALLS AND SLABS**

This work shall consist of furnishing, mixing, delivering and placing of the concrete for the construction of culvert walls and slabs, in accordance with these Specifications and in conformity with the requirements shown on the Drawings.

Concrete class 25/20 shall be used for Culvert walls and slabs.

**(a) Concrete Materials**

(i) Cement: Cement shall be of Portland type and shall conform to the requirements of BS 12 or equivalent.

The contractor shall select only one type or brand of cement or others. Changing of type or brand of cement will not be permitted without a new mix design approved by the Engineer. All cement is subject to the Engineer's approval; however, approval of cement by the Engineer shall not relieve the Contractor of the responsibility to furnish concrete of the specified compressive strength.

Conveyance of cement by jute bags shall not be permitted. Storage in the Contractor's silo or storehouse shall not exceed more than two (2) months, and age of cement after manufacture at mill shall not exceed more than four (4) months. The Contractor shall submit to the Engineer for his approval the result of quality certificate prepared by the manufacturer.

Whenever it is found out that cement have been stored too long, moist, or caked, the cement shall be rejected and removed from the project.

**(b) Aggregates**

Fine and coarse aggregates must be clean, hard, strong and durable, and free from absorbed chemicals, clay coating, or materials in amounts that could affect hydration, bonding, strength and durability of concrete. Grading of aggregates shall conform to the following requirements:

**(i) Grading of Fine Aggregates**

Sieve Size	Percentage by Weight Passing
10 mm	100
5 mm	89-100
2.5 mm	60-100
1.2 mm	30-100
0.6 mm	15- 54
0.3 mm	5- 40
0.15 mm	0 – 15

**(ii) Grading of Coarse Aggregates**

Size of Coarse Aggregate	Amounts finer than each standard sieve percentage by weight						
	40	30	25	20	15	10	5
2.5	100	~	~	90-100	~	30-69	0-10
	~						

Other requirements for aggregates are as follows:

**(iii) Fine Aggregates**

Fitness Modulus, AASHTO M-6 : 2.3 – 3.1  
Sodium Sulphate Soundness, AASHTO T104: Max. 10% loss  
Content of Friable Particles AASHTO 112 : Max 1% by weight  
Sand Equivalent, AASHTO T176 : Min. 75

**(iv) Coarse Aggregate**

Abrasion, AASGTO T96 : Max. 405 loss  
Soft Fragment and shale, AASHTO M80 : Max. 5% by weight  
Thin and elongated Pieces, AASHTO M80 : Max. 15%

**(v) Water**

All sources of water to be used with cement shall be approved by the Engineer. Water shall be free from injurious quantities of oil, alkali, vegetable matter and salt as determined by the Engineer.

**(vi) Admixture**

Only admixture, which have been tested and approved in the site laboratory through trial mixing for design proportion shall be used. Before selection of admixture, the Contractor shall submit to the Engineer the specific information or guarantees prepared by the admixture supplier.

The contractor shall not exclude the admixture from concrete proportions.

### **Concrete class 20/20**

Concrete class 25/20 shall be used for culvert walls and slabs. The requirements of Concrete class 25/20 are provided as follows unless otherwise the Engineer will designate any alteration.

Design compressive strength (28 days) : 25N/mm<sup>2</sup>  
Maximum size of coarse aggregates : 20mm  
Maximum water/cement ratio of 45% with slump of 80mm

#### **(d) Proportioning Concrete**

The Contractor shall consult with the Engineer as to mix proportions at least thirty (30) days prior to beginning the concrete work. The actual mix proportions of cement, aggregates, water and admixture shall be determined by the Contractor under supervision of the Engineer in the site laboratory.

The Contractor shall prepare the design proportions which has 120% of the strength requirement specified for the designated class of concrete.

No class of concrete shall be prepared or placed until its job-mix proportions have been approved by the Engineer.

#### **(e) Concrete Work**

##### **(ii) Batching**

Batching shall be done by weight with accuracy of:

Cement : ½ percent  
Aggregate : ½ percent  
Water and Admixture : 1 percent.

Equipment should be capable of measuring quantities within these tolerances for the smartest batch regularly used, as well as for larger batches.

The accuracy of batching equipment should be checked every month in the presence of the Engineer and adjusted when necessary.

##### **(iii) Mixing and delivery**

Slump of mixed concrete shall be checked and approved at an accuracy of +25mm against designated slump in these specifications.

##### **(iv) Concrete in hot weather**

No concrete shall be placed when the ambient air temperature is expected to exceed thirty three degrees celsius (330c) during placement operations).

**(v) Concreting at night**

No concrete shall be mixed, placed or finished when natural light is insufficient, unless an adequate approved artificial lighting system is operated; such night work is subject to approval by the engineer.

**(vi) Placing**

In preparation of the placing of concrete, the interior space of forms shall be cleaned and approved by the engineer prior to placing concrete. All temporary members except tie bars to support forms shall be removed entirely from the forms and not buried in the concrete. The use of open and vertical chute shall not be permitted unless otherwise directed by the engineer.

The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms.

**(f) Measurement and Payment**

Measurements for the Concrete Works Class 20/20 of culvert walls and slabs shall be made in cubic metres for the walls and slabs actually constructed, measured from their dimensions shown on the Drawings. Payment for the Concrete Works (Class 20/20) of culvert walls and slabs shall be the full compensation for furnishing all materials of the concrete mixing, delivering, placing and curing the concrete, equipment and tools, labour and other incidental necessary for the completion of the work in accordance with the Drawings and these Specifications and as directed by the Engineer.



## **SECTION 20 - ROAD FURNITURE**

### **2001 ROAD RESERVE BOUNDARY POSTS**

Road reserve boundary posts shall be provided as directed by the Engineer and in compliance with Standard Specification clause 2001. They shall be placed at 50m. intervals along the boundary of the road reserve.

### **2003 EDGE MARKER POST**

Edge marker post shall be provided as directed by the Engineer and in compliance with Standard Specification clause 2003

### **2004 PERMANENT ROAD SIGNS**

Permanent Road Signs shall be provided as directed by the Engineer and in compliance with the requirements of the "Manual for Traffic Signs in Kenya" Part II and standard Specification clause 2004.

### **2004B EXISTING ROAD SIGNS**

Where directed by the Engineer, the Contractor shall take down road signs including all posts, nuts, bolts and fittings, and remove and dispose of the concrete foundation and

backfill the post holes. The signs shall be stored as directed by the Engineer.

Measurement and payment for taking down road signs shall be made by the number of signs of any type and size taken down, cleaned and stored as directed.

## **2005 ROAD MARKING**

Paint for road marking shall be internally reflectorized hot applied thermoplastic material in accordance with Clause 219 of the Standard Specification.

The rates inserted in the Bills of Quantities for road marking shall include for prior application of approved tack coat.

## **2005A RAISED PAVEMENT MARKERS – ROAD STUDS**

### **MATERIAL**

Road studs are moulded of acrylonitrile butadiene styrene (ABS) conforming to ASTM Specification D1788 – 68, class 5-2-2 shell filled with inert, thermosetting compound and filler. The lens portion of the marker of the marker is of optical menthly methacrylic.

### **CONSTRUCTION**

The road studs shall be constructed of high impact ABS containing a multi-biconvex glass lens reflector system. It shall be of monolithic construction, and not less than 98.5. m<sup>2</sup>. The height of the marker shall not exceed 17mm and the underside shall contain a non-honeycomb base (flat).

### **REQUIREMENTS**

The markers shall conform to the following requirements

#### **Color**

Shall be white, yellow or red as specified and the Retro – reflectance values should conform to the testing procedures of ASTM E 809.

#### **Impact Resistance**

The marker shall not crack or break when tested using a 1000-gram weight from a height of 1 metre. (ASTM D 2444) or BS 3900 Part E3.

#### **Resistance to Water Penetration**

Shall not have water penetration behind the lens after submerged in a water bath at 70 + 50 of for 10 minutes. And it should still meet the reflectance Requirement. BS 998.

#### **Heat Resistance**

Shall comply with the initial brightness as per BS 873 Part IV of 1978

### **Night Visibility**

The marker shall be bright as per BS 873 Part IV of 1978

### **Compression Resistance**

There shall be no cracking sound at a pressure lower than 25 tones as per BS 873 Part IV of 1978.

### **Corrosion Resistance**

After immersing a sample of Road stud in a solution containing 30g/l of sodium chloride for 30 days, there shall not be any signs of corrosion ~ (BS998).

**NOTE:** These markers are intended for application directly to pavement surfaces and are compatible with raised pavement markers. These adhesives should be of high quality and tested for conformance to customer requirements.

### **ADHESIVES**

They shall be of Resin Type–Epoxy of 2 different components part 1 and 2 i.e Adhesive and Reactor without any volatile solvents in both.

Pot life:	not less than 20 minutes at 20 °C
Rotational cure time:	between 20 and 30 minutes at 20 °C
Hard cure:	Between 40 and 60 minutes at 20 °C

### **APPLICATION INSTRUCTION**

#### **Preparation of Pavements**

Make sure that the road surface is absolutely dry and free of oil and grease.

#### **Mixing of Adhesive**

Pour component B into the container of component A. Stir mixture by hand with a wooden or metal stick until uniform Grey Tint without a striae is obtained.

#### **Installation**

Pour the mixture on to the underside of the road stud. Then place the road stud firmly on the road surface. Adhesive should stand out for about 5mm to 10 mm over the edges of the stud.

#### **Protection from the Traffic**

Protect studs from traffic for 2 hours until the adhesive has properly hardened. Try by touching the adhesive.

#### **NUMBER OF STUDS NEEDED FOR LABORATORY TESTS.**

In order to approve a particular type of road stud, 4 sample road studs of each colour shall be submitted.

## **2006 GUARDRAILS**

Contrary to the Standard Specification, guardrail posts shall be concrete 200 mm diameter set vertically at least 1.2m into the shoulder as directed by the Engineer. Spacer blocks shall also be made of concrete.

Beams for guardrails shall be "Armco Flex-beam" or similar obtained from a manufacturer approved by the Engineer.

## **2007 KERBS**

### **a) Vertical Joints**

Vertical joints between adjacent Kerbs shall not be greater than 5 mm in width and shall be filled with a mortar consisting of 1:3 cement: sand by volume.

### **b) Transition between flush and raised kerbs**

The transition between flush and raised kerbs (e.g. at bus bays) shall be termed as ramped kerbs. The transition between flush and raised kerbs shall occur within a length of 2.0 m.

## **2008 KILOMETRE MARKER POSTS**

Kilometer marker posts shall be provided as directed by the Engineer and in compliance with Standard Specification clause 2008.

## **2009 RUMBLE STRIPS**

Where directed by the Engineer, the Contractor shall provide, place, trim, shape and compact to line and level asphalt concrete rumble strips on the finished shoulders. This shall be done to the satisfaction of the Engineer

## **2011 MEASUREMENT AND PAYMENT**

### **Road reserve boundary posts**

Road reserve boundary posts shall be measured by the number erected

### **Permanent road signs**

Permanent road signs shall be measured by the number of each particular size erected.

### **Road marking**

Road markings in yellow or white material shall be measured in square metres calculated as the plan area painted.

### **Road Studs**

Road studs shall be measured by the number of each particular size erected.

### **Guardrail**

Guardrail shall be measured by the meter as the length of the guardrail constructed.

### **Kerbs**

Kerbs shall be measured by the meter as the length of kerbs constructed

## **SECTION 22-DAYWORKS**

### **2202 MEASUREMENTS AND PAYMENT**

#### **(a) Plant**

Where items of major plant listed in the schedule of Day works are specified by type (e.g. Concrete mixer etc.) the power rating if such items of plant are provided by the Contractor shall not be lower than the power ratings of such plant manufactured within the last two years prior to the date of BID. Any item of major plant employed upon Dayworks that has a power rating lower than specified above shall be paid for at rates lower than those in the schedule of Dayworks. The reduction in the rate payable shall be in proportion to the reduction in power rating below that specified above.

## **SECTION 23: CONCRETE PAVING BLOCKS**

This works shall consist of providing, laying and fixing of concrete paving blocks and concrete paving slabs on a sand base on the driveway and walkways and other areas as directed by the Engineer.

#### **a. Concrete Paving Blocks**

The paving blocks shall be of type S of any shape fitting within a 295 mm square coordinating space and a work size thickness of at least 30 mm. The blocks shall conform to the requirements of BS 6717:Pt. 1:1986 or Kenya standard equivalent.

The laying shall be broken at intervals of 50 m by concrete ribs of class 25 concrete.

The blocks shall be laid on a 40 mm minimum sand base whose specifications are as in section (b) of this specification.

#### **b. Sand For Sand Base**

Sand used as bedding for paving blocks and slabs shall be natural sand either pit or river sand. The grading shall conform and be parallel as much as possible to KS02 – 95 Parts 1 & 2: 1984 for zones 1,2 or 3. The other requirements shall be as specified in section 1703 (c) of Standard Specifications.

#### **c. Measurement and Payment**

Payment for paving blocks and paving slabs shall be by square metre laid. The rate quoted would include the cost of haulage to site of the blocks, slabs and sand, as no extra payment shall be made for haulage

## **SECTION VII- BILLS OF QUANTITIES**

### **1. Objectives**

The objectives of the Bill of Quantities are:

- a) to provide sufficient information on the quantities of Works to be performed to enable tenders to be prepared efficiently and accurately; and
- b) when a Contract has been entered into, to provide a priced Bill of Quantities for use in the periodic valuation of Works executed.

In order to attain these objectives, Works should be itemized in the Bill of Quantities in sufficient detail to distinguish between the different classes of Works, or between Works of the same nature carried out in different locations or in other circumstances which may give rise to different considerations of cost. Consistent with these requirements, the layout and contents of the Bill of Quantities should be as simple and brief as possible.

### **2. Day work Schedule**

A Day work Schedule should be included only if the probability of unforeseen work, outside the items included in the Bill of Quantities, is high. To facilitate checking by the Procuring Entity of the realism of rates quoted by the Tenderers, the Day work Schedule should normally comprise the following:

- a) A list of the various classes of labor, materials, and Constructional Plant for which basic day work rates or prices are to be inserted by the Tenderer, together with a statement of the conditions under which the Contractor shall be paid for work executed on a day work basis.
- b) Nominal quantities for each item of day work, to be priced by each Tenderer at day work rates as Tender. The rate to be entered by the Tenderer against each basic day work item should include the Contractor's profit, overheads, supervision, and other charges.

### **3. Provisional Sums**

A general provision for physical contingencies (quantity overruns) may be made by including a provisional sum in the Summary Bill of Quantities. Similarly, a contingency allowance for possible price increases should be provided as a provisional sum in the Summary priced Bill of Quantities. The inclusion of such provisional sums often facilitates budgetary approval by avoiding the need to request periodic supplementary approvals as the future need arises. Where such

provisional sums or contingency allowances are used, the Special Conditions of Contract should state the manner in which they shall be used, and under whose authority (usually the Project Manager's).

The estimated cost of specialized work to be carried out, or of special goods to be supplied, by other contractors should be indicated in the relevant part of the Bill of Quantities as a particular provisional sum with an appropriate brief description. A separate procurement procedure is normally carried out by the Procuring Entity to select such specialized contractors. To provide an element of competition among the Tenderers in respect of any facilities, amenities, attendance, etc., to be provided by the successful Tenderer as prime Contractor for the use and convenience of the specialist contractors, each related provisional sum should be followed by an item in the Bill of Quantities inviting the Tenderer to quote a sum for such amenities, facilities, attendance, etc.

These Notes for Preparing a Bill of Quantities are intended only as information for the Procuring Entity or the person drafting the tendering document. They should not be included in the final tendering document.

#### **4. The Bills of Quantities**

The Bills of Quantities should be divided generally into the following sections:

- a) Preambles
- b) Preliminary items
- c) Work Items
- c) Day work Schedule;and
- d) Provisional items
- e) Summary.

<b>Contract Name</b>	<b>PERIODIC MAINTENANCE OF PACKAGE 5 ROADS KURA/RMLF/UE/285/2024-2025</b>				
<b>Road Name</b>	<b>A2 – LITTLE ANGELS ROAD</b>				
<b>Bill of Quantities</b>					
<b>Bill No.1</b>	<b>General: Office administration and overheads/Preliminaries</b>				
<b>Item No.</b>	<b>Description</b>	<b>Units</b>	<b>Quantity</b>	<b>Unit Bid Rate (Kshs.)</b>	<b>Amount (Kshs.)</b>
01.80.042D	Allow for survey work	PC SUM	50,000	1	50,000.00
01.80.042E	Extra over on item 01.80.042D for contractor's overheads and profits	%	50,000		
01.80.010	Allow a prime cost of sum for material testing as directed by the Engineer	PC SUM	30,000	1	30,000.00



01.80.011	Extra over item 01-80-010 for contractors' overheads and profits	%	30,000		
01.80.026	Prime cost sum for RE's miscellaneous account	PC SUM	150,000	1	150,000.00
01.80.027	Extra Over on Item 01-80-026 for the Contractor's Overheads and Profit.	%	150,000		
01.80.030a	Prime cost sum for payment of allowances for Engineer's site staff	PC SUM	300,000	1	300,000.00
01.80.030b	Extra Over on Item 01-80-030a for the Contractor's Overheads and Profit.	%	300,000		
01.80.030	Prime cost sum for wages for RE's site staff inclusive of overtime, taxes and other statutory deductions	PC SUM	250,000	1	250,000.00
01.80.031	Include percentage of PC sum in item 01-80-030 for contractors overhead and profit	%	250,000		
<b>Total Carried Forward to Summary:</b>					

<b>Road Name A2 – LITTLE ANGELS ROAD</b>					
<b>Bill of Quantities</b>					
<b>Bill No.4</b>	<b>SITE CLEARANCE</b>				
<b>Item No.</b>	<b>Description</b>	<b>Units</b>	<b>Quantity</b>	<b>Unit Bid Rate (Kshs)</b>	<b>Amount (Kshs.)</b>

04.60.001	<b>Site Clearance</b> Clear site on road reserve including removal of trees, hedges, bushes and other vegetation and other deleterious materials, grub up roots and backfilling of holes left by removal of stumps and roots in accordance with the Specifications, as shown in drawings and as directed by Engineer	M <sup>2</sup>	4,500		
04.80.002	<b>Topsoil Stripping</b> Removal of top soil to a maximum depth of 200 mm including excavation, loading and disposal but excluding replacement by suitable soil which shall be paid separately	M <sup>3</sup>	740		
04.90.001	Allow a Prime Cost for removal and relocation/reinstatement of services	PC SUM	200,000	1	200,000.00
04.90.001a	Extra over on item 04.90.001 for contractors' overheads and profits	%	200,000		
	<b>Total Carried Forward to Summary:</b>				

Road Name	A2 – LITTLE ANGELS ROAD				
Bill of Quantities					
Bill No.5	EARTHWORKS				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs.)	Amount (Kshs.)
<i>Note: All costs and haulage are to be included within the unit rates entered against the items described in the Bill of Quantities</i>					
05.50.006	Provide and fill in soft material and compact	M <sup>3</sup>	1,200		
05.50.008a	Cut in soft material to spoil	M <sup>3</sup>	2,800		
05.50.009a	Cut in hard material to spoil	M <sup>3</sup>	60		
05.60.016	Compaction of existing ground below fills to at least 95% MDD (AASHTO T.99) including all necessary scarifying and water to a depth of 150mm below ground level.	M <sup>3</sup>	450		
05.50.125	Provide, place & compact rockfill	M <sup>3</sup>	1,600		
<b>Total Carried Forward to Summary:</b>					

Road Name	A2 – LITTLE ANGELS ROAD				
Bill of Quantities					
Bill No.7	EXCAVATION AND FILLING FOR STRUCTURES				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs.)	Amount (Kshs.)
07.70.001	Provide stone pitching including grouting of ratio 1:4 cement to Mortar as directed by the Engineer.	M <sup>2</sup>	520		
<b>Total Carried Forward to Summary:</b>					

Road Name A2 – LITTLE ANGELS ROAD					
Bill of Quantities					
Bill No.8	CULVERT AND DRAINAGE WORKS				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs)	Amount (Kshs.)
<i><u>Note: No separate payment shall be made for dewatering, haulage of surplus or unsuitable excavated material, and/or providing, placing and compacting of approved gravel as bed to the culverts, such costs shall be deemed to be included in the rates and prices.</u></i>					
08.50.002	Clean silted drain to free flow condition and cart away the debris.	M	100		
08.50.005a	Excavate/desilt, grade to shape inlets outfalls, side drains to free flow conditions including cart to spoil any excess grass debris and soils as and where directed by the Engineer.	M <sup>3</sup>	360		
08.60.003	Clean culverts of all sizes to free flow conditions	M	28		
08.60.030	Excavate in soft material for culverts	M <sup>3</sup>	50		
08.60.022	Provide, lay and join 450mm inner diameter concrete pipes	M	12		
08.60.024	Provide, lay and join 600mm inner diameter concrete pipes	M	40		
08.60.032	Provide, place and compact class 15/20 concrete	M <sup>3</sup>	58		
08.60.034	Provide, place and compact class 25/20 concrete	M <sup>3</sup>	24		
08.60.035	A142 Fabric mesh	M <sup>2</sup>	108		
<b>Total Carried Forward to Summary:</b>					

Road Name	A2 – LITTLE ANGELS ROAD				
Bill of Quantities					
Bill No.9	PASSAGE OF TRAFFIC				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs.)	Amount (Kshs.)
09.60.001	Allow for the passage of traffic through the works	LS SUM	100,000.00	1.0	100,000.00
<b>Total Carried Forward to Summary:</b>					

Road Name	A2 – LITTLE ANGELS ROAD				
Bill of Quantities					
Bill No.12	NATURAL MATERIAL BASES AND SUBBASE				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs.)	Amount (Kshs.)
<i><u>Note: No separate payments shall be made for the overhaul of material and the cost of such haulage shall be included in the rates and or prices</u></i>					
12.50.003	Provide, place and spread natural lateritic gravel of CBR greater than 60% as subbase	M <sup>3</sup>	500		
12.50.004	Provide, place and spread natural lateritic gravel as base material	M <sup>3</sup>	500		
<b>Total Carried Forward to Summary:</b>					

Road Name	A2 – LITTLE ANGELS ROAD				
Bill of Quantities					
Bill No.14	CEMENT & LIME TREATED MATERIAL				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs.)	Amount (Kshs.)

14.50.001	Provide, transport to site and spread cement on natural gravel or GCS material for base	Ton	26		
14.50.003	Allow for mixing in cement	M <sup>3</sup>	500		
14.50.004	Allow for curing and protection of treated layers	M <sup>2</sup>	4,000		
<b>Total Carried Forward to Summary:</b>					

Road Name	A2 – LITTLE ANGELS ROAD				
<b>Bill of Quantities</b>					
Bill No.15	BITUMINOUS SURFACE TREATMENT AND SURFACE DRESSING				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs.)	Amount (Kshs.)
<i>Note: No haulage will be paid for bitumen or chippings and this should be included in the rates tendered. The exact spray and spread rates shall be directed by the Engineer on site.</i>					
15.50.002	Provide and Spray MC 30 cut-back bitumen as prime coat to carriageway, shoulders, busbays and junctions at rate 0.8-1.2 lts/m <sup>2</sup> as prime coat	L	4,000		
15.50.003a	Provide and spray K- 160 as tack coat at a rate of 0.8-1.0 L/sq metre as directed by the Engineer	L	3,200		
<b>Total Carried Forward to Summary:</b>					

Road Name	A2 – LITTLE ANGELS ROAD				
Bill of Quantities					
Bill No.16	BITUMINOUS MIXES				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs.)	Amount (Kshs.)
	<i>Note: No haulage, variation in binder/mineral filler/sand will be paid for bituminous mix bases and Asphalt Concrete (AC) wearing course and shall be deemed to be included in the tenderers rate.</i>				
16.60.001	Prepare surfaces, provide, mix, lay and compact Asphaltic Concrete (AC) Type 1 (0/14 mm gradation) as wearing course to carriageway with bitumen content as per specification and as directed by the Engineer.	M <sup>3</sup>	143		
	<b>Total Carried Forward to Summary:</b>				

Road Name	A2 – LITTLE ANGELS ROAD				
Bill of Quantities					
Bill No.20	ROAD FURNITURE REPAIR AND MAINTENANCE				
Item No.	Description	Units	Quantity	Unit Bid Rate (Kshs.)	Amount (Kshs.)
20.50.011	Excavate for, provide and place 125 x 100 mm class 25/20 precast concrete channels haunched in 100 mm thick class 15/20 concrete base bedding and mortar joined in support to carriageway as directed by the Engineer.	M	1,180		

20.50.012	Excavate for, provide and place 250 x 125 mm class 25/20 precast concrete raised kerbs haunched in 100 mm thick class 15/20 concrete base bedding and mortar joined in support to carriageway as directed by the Engineer.	M	350		
20.50.007	Road Marking - Thermoplastic White Paint	SM	78		
20.50.006	Road Marking - Thermoplastic Yellow Paint	SM	40		
<b>Total Carried Forward to Summary:</b>					

<b>Road Name</b>	<b>A2 – LITTLE ANGELS ROAD</b>				
<b>Bill of Quantities</b>					
<b>Bill No.25</b>	<b>CROSS CUTTING ISSUES</b>				
<b>Item No.</b>	<b>Description</b>	<b>Units</b>	<b>Quantity</b>	<b>Unit Bid Rate (Kshs.)</b>	<b>Amount (Kshs.)</b>
25.50.029b	Collect, erect, brand and maintain publicity signs and return to the employer upon expiry of the contract period as instructed by the Engineer	No.	1		
25.50.001a	Allow for preparation of monthly reports on HIV/AIDS awareness and prevention activities. Report to be tabled at site meetings.	Months	3		
25.50.005	Environmental Mitigation (Tree Planting and Naturing of trees along the project road corridor or nearby public institution during the project period)	No.	30		
<b>Total Carried Forward to Summary:</b>					

The Summary to the Bills of Quantities will take this form or some other form but including these items.

<b>Road Name</b>	<b>A2 – LITTLE ANGELS ROAD</b>
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Bill of Quantities		
	Summary	
Item No.	Description	Amount (Kshs)
1	GENERAL: Office Administration and Overheads/Preliminaries	
4	SITE CLEARANCE AND TOP SOIL STRIPPING	
5	EARTHWORKS	
7	EXCAVATION AND FILLING FOR STRUCTURES	
8	CULVERTS AND DRAINAGE WORKS	
9	PASSAGE OF TRAFFIC	
12	NATURAL MATERIAL BASE AND SUB BASE	
14	CEMENT AND LIME TREATED MATERIAL FOR SUBBASE AND BASE	
15	BITUMINOUS SURFACE TREATMENT AND SURFACE DRESSING	
16	BITUMINOUS MIX BASES, BINDER COURSES AND WEARING COURSES	
20	ROAD FURNITURE	
25	CROSS - CUTTING ISSUES	
	<b>Sub Total</b>	
	<b>Add 16% of Sub-Total for Value Added Tax</b>	
	<b>Grand Total</b>	
	<b>Carried to page on the form of Tender</b>	