

SECTION 1 - *SPECIAL SPECIFICATION*

The Special Specifications are to be read in conjunction with the Standard Specification for Road and Bridge Construction, Ministry of Transport and Communications, 1986.

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SPECIAL SPECIFICATION

SECTION 1 - GENERAL

Special Specifications are supplementary to the Standard Specifications, and the two must be read in conjunction with one another. In case there appears to be a conflict between the two, then the Special Specifications will take precedence.

101 LOCATION AND EXTENT OF SITE

The proposed project roads are located in Meru County, Imenti North Subcounty, and are links to the Meru Eastern and Western Bypass Roads. Meru County's position on the eastern slopes of Mt Kenya and the equator has highly influenced its natural conditions. Altitude for the project roads ranges from 1396m at the Western Bypass – Mate Section in the southeast, to 1728m above sea level at Kambakia – KeMU section in the northwest.

The project area generally has a cool subtropical highland climate with a long and short rainy season. The long rains start from March and continue to the end of May, and from October and continue to the end of December. The average rainfall in the project area varies from 1200 to 2500mm. The average daily maximum temperature is 28.8°C and the average daily minimum temperature is 8.9°C. The coldest months being July to August, while October and March are the hottest.

The County population as per the 2019 Kenya Population and Housing Census (KPHC) was approximately 1,545,714 with Imenti North Subcounty having a population of 177,567.

The site of the works shall be the area within the road reserve and any other places as may be designated in the Contract. The works involve the construction of the project roads (17.5km), junctions, and bus bays at designated locations as shown on the Book of Drawings or as directed by the Engineer. Any other works shall be as directed by the Engineer.

102 EXTENT OF CONTRACT

General

The works specified under this Contract shall include all general and ancillary works and work of any nature that is deemed necessary for the due and satisfactory construction, completion and maintenance of the Works to the full extent and meaning of the Drawings and Specifications, whilst complying with all general Conditions of Contract whether specifically mentioned or not in the clauses of the Specifications.

Scope of Works

The works to be executed under the contract consists of but are not limited to the following:

Preliminaries And General:

- a) Provision (Build or Rent) of Resident Engineer's offices and Laboratories;
- b) Provision (Build or Rent) of Resident Engineer's Staff housing;

Permanent Work

- a) Site Clearing of the working area within the road reserve
- b) Topsoil stripping
- c) Excavate to spoil 0.6m of existing subgrade and any unsuitable material in the subgrade along the alignment within the construction width, to be replaced with a 250mm layer of

- impermeable improved subgrade material of minimum S2 (CBR 7.5%) quality fill material to final earthworks level after site clearance operation.
- d) Earthworks comprising medium height embankment construction, excavation, and backfilling of unsuitable material areas
 - e) Embankment protection works and provision of longitudinal ditches (covered or open-lined ditches)
 - f) Provide a drainage system, including installation of any cross, access culverts, and outfalls with appropriate features and scour protection works
 - g) Construction of a 350mm layer of improved subgrade material of minimum S4 (CBR 15%) to form Improved Subgrade in two layers.
 - h) Construction of a 200mm thick layer of cement improved natural gravel (base quality) to form the Subbase in one layer.
 - i) Construction of a 150mm/ 175mm/ 200mm thick layer of graded crushed stone (GCS) to form the Base in one layer.
 - j) Construction of a 50mm thick layer of 0/20 "Superpave" AC to form the wearing course;
 - k) Construction 2No footbridges at Kaaga Boys and Meru Polytechnic as shown in the drawings.
 - l) Construction of walkways and bus bays adjacent to the carriageway as indicated in the plan drawings.
 - m) Provision and installation of road furniture
 - n) Any other operation ancillary to the main works.
 - o) Maintenance of existing roads ahead of the works

The Works detailed above are only indicative of the Scope of Works associated with this contract and the Engineer may, where necessary, substitute some of the Works with others within the project areas without substantially altering the overall Scope of the Works. Work shall be measured and paid using the relevant rates and prices in the Bill of Quantities.

The works will also include for any operations necessary for the safe and convenient passage of through and local traffic at all times.

102.1 Compliance with Specification

All material, plant, labour and workmanship in and connected with the execution of the works shall be the best of their respective kinds without regard to any trade terms and the Contractor shall comply with these and all other respects with the relevant Clauses in the Specification and shall carry out the Contract in a proper and workmanship like manner and in strict accordance with Specifications, Working Drawings and Instructions of the Engineer.

103 CONTRACT DRAWINGS

Contract drawings have been bound in a book of drawings accompanying these Contract Documents as a separate volume. Additional copies of these drawings that may be required by the Contractor can be obtained from the Engineer at the Contractor's expense.

The Engineer may from time to time, in order to enable the satisfactory completion of the works, revise, amend or supersede any of these drawings. It shall be the Contractor's responsibility to construct all works in conformity with the latest revision, amendment or superseding drawings, provided that the Engineer has given to the Contractor in writing such reasonable prior notices of intention to revise, amend or supersede as the nature of the intended change requires, and the relevant drawings have been issued to the Contractor.

Documents

The following manuals will not be issued with the tender documents but will be available for inspection during normal working hours at the offices of the General Manager (Special Projects), P. O. Box 49712-00100 Nairobi, Kenya.

Road Design Manual:

Part 1: Geometric Design for Rural Roads

Part 3: Materials and Pavement Design for New Roads

Manual for Traffic Signs:

Part 1: Road Markings

Part 2: Informatory Signs, Warning Signs, and Regulatory Signs.

104 PROGRAMMES OF EXECUTION OF THE WORKS

The Contractor shall provide the works programme required under Clause 8.3 of the Conditions of Contract within twenty eight (28) days of receipt of the Engineer's order to commence work. The programme shall be in the form of a computerised critical path method, and shall be updated every two (2) months to reflect all the circumstances affecting the progress of the works at that time.

The programme shall be coordinated with climatic and other conditions to provide for the completion of the works in the order and by the time specified.

The Contractor shall carry out the contract in accordance with the programme agreed with the Engineer, but he shall in no manner be relieved by the Engineer's approval of the programme, of his obligation to complete the works in the prescribed order and by the prescribed completion date and he shall from time to time review his progress and make such amendments to his rate of execution of the works as may be necessary to fulfil his obligations.

The Contractor shall make allowance in his works program for the requirements of Clause 1506A of the Special Specifications, and any associated additional costs shall be included in his rates and prices generally.

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 road is provided.

107 CERTIFICATE OF SUBSTANTIAL COMPLETION

The minimum length of road for which a certificate will be issued is Seventeen and a half (17.52) kilometres of continuous road when substantially completed.

The restoration of borrow pits and quarries is subject to the restoration requirements of Section 6 of these Specifications and the issue of certificate of substantial completion shall be subject to the satisfactory restoration of the borrow pits used.

108 METHOD OF CONSTRUCTION

The Engineer's normal working hours shall be 8 hours from Monday to Friday and 5 hours on Saturday with Sunday set aside for rest.

If the Contractor wishes to execute permanent works outside these hours, he shall meet any extra costs arising thereof in addition to giving a day's notice in writing.

109 NOTICE OF OPERATIONS

Add the following Sub- Clauses:

109.1 Notification Terms

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

Explosive and Blasting

1. 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.
2. No explosives of any kind shall be used without prior written consent of the Engineer.
3. 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

The Contractor shall prepare a specific Occupational Health and Safety Management Plan for the project, which shall be submitted to the Engineer not later than 4 weeks after the notice to commence the Works. This Management Plan shall incorporate but not be limited to, the requirements of Clause 117, and identify the risks and mitigation measures, and specify monitoring indicators and reporting requirements.

As part of the occupational health and safety program the Contractor shall provide training for all employees on how to ensure their own personal safety, and on ways to reduce the accident risk on site. The Safety Officer shall provide training in safe work practices and general awareness of potential danger situations to avoid injuries. In addition, all employees handling dangerous/toxic materials shall be trained on how to handle such substances.

All the Contractor's personnel shall, before commencing work, have an induction course on safety and health at the site. The information and training shall be on site and have duration of at least two (2) hours. It shall be conducted in a language which is appropriate for the personnel, to ensure that all personnel can understand the information and instruction. Follow-up training sessions shall be carried out during the course of the project.

There is no separate payment for these requirements and the costs should be included in the Contractor's rates and prices generally.

Failure by the Contractor to employ a suitably qualified Safety Officer and institute health and safety measures on site may lead to withholding of payment certificates due to the Contractor until such a time that the Engineer is satisfied that adequate health and safety measures are in place.

120 PROTECTION OF EXISTING WORKS AND SERVICES

- a) 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 or for the making good of damage caused thereby to the existing services.

- b) 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 be responsible for arranging for the moving of services, subject to the approval of the Engineer, where necessitated by the Works and shall pay any charges arising from the moving of the services or alteration to services such as power lines, telephone lines, water pipes and the like. Prime Cost sums for this work have been included in the Bill of Quantities No.1. Subject to the approval of the Engineer and upon production of payment receipts from the service authorities, the Contractor shall be reimbursed in interim payment certificates the net cost of such moving or alteration, plus the percentage inserted in the Bill of Quantities for the Contractor's overheads and profits in making the payment, which includes for the liaison and arranging of the moving of services.
- b) Immediately after the Engineer's order to commence work, the Contractor shall identify all services along the project road, and following approval from the Engineer, shall arrange for their prompt relocation where necessitated by the Works. The Contractor's work programme shall allow adequate time for the identification and relocation of services.

123 LIAISON WITH GOVERNMENT AND POLICE OFFICIALS

The Contractor shall work closely with the Police and 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 PROVISION OF LAND

The Employer will only provide land to accommodate the road reserve and roadside amenities, and all other land required by the Contractor for the execution of the contract is subject to the prior approval of the Engineer, but is the total responsibility of the Contractor. The Contractor will make all necessary arrangements with the property owners concerned and pay all charges arising there from, on or before the completion of the contract. This includes land for all camps sites and for the contractor's own purposes, including the temporary works.

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.

The Contractor shall notify the Engineer of any encroachment into the road reserve at the earliest opportunity.

. **125 WATER**

There are several small rivers along the road alignment mostly used for domestic use by locals.

The contractor is expected to supply clean water as indicated in clause 125 of standard specification and take due consideration of these in his rates.

. **126 MATERIALS AND MANUFACTURED GOODS**

Notwithstanding the provisions of Clause 126 of the Standard Specification, the Contractor's attention is drawn to his obligations with regard to quality and delivery schedule of materials and goods obtained from suppliers. Should the Engineer at any time be dissatisfied with any goods and materials intended for use by the Contractor upon the Works, he shall be empowered to reject the goods and materials and shall order that others of acceptable quality replace them. Any more work that may consequently have to be redone and the costs of the new supplies shall be borne by the Contractor.

. **127 INFORMATION FROM EXPLORATORY BORING AND TEST PITS**

Omit the content of Clause 127 and substitute the following Sub-Clauses: -

127.1 Factual Materials Report

The Factual Materials Report for this Contract does not form part of the Contract Documents. However, the Report will be made available for the *Contractor's information only*, and any conclusions on issues such as suitability of materials, location of borrow pits, material quantities etc., made by the Contractor on the basis of the Factual Materials Report, will be at his own risk.

127.2 Trial Sections

The Contractor shall allow in his programme for constructing trial sections and carrying out tests upon them as directed by the Engineer. Trials would normally be required at the start of each pavement layer and if changes of materials, method, or equipment deem it necessary, as directed by the Engineer. The time for completion of the Contract shall not be extended because of the time needed to construct trial sections and evaluate the tests on them.

At least fourteen (14) days before the work of laying any pavement layer is commenced, the contractor shall construct trial sections of at least 100 m in length and to the full construction width and the specified pavement layer thickness. For each trial section, the Contractor shall use the materials, mix proportions, mixing, laying, compaction equipment and construction procedure that he proposes to use for the main work. The main work of laying the pavement layer shall not be commenced until this trial has been tested and approved by the Engineer.

No variation in the construction procedure, mix proportions, size, grading or source of any of the constituents shall be made without the agreement of the Engineer who may first require new trial sections to be carried out.

Trial sections, if found satisfactory, will be paid for under the rates in the Bill of Quantities for the appropriate items, as if the trial sections were part of the normal work. No separate payment will be made for trial sections and testing.

The Contractor shall make good, at his own expense; any trial sections that fail to meet the specified standards. The standards shall include, but not be limited to, material quality, layer thickness, levels and compaction.

. **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.

. **130 PROGRESS PHOTOGRAPHS**

Add the following paragraphs (a) and (b):

(a) Video Coverage of Progress of Works

Where instructed by the Engineer, the Contractor shall pay for professional video coverage of the works which shall be undertaken immediately upon handing over the site to the contractor and upon completion of works and at frequencies and intervals instructed. The video recording shall include voice track, text and subtitles of works before and during construction and shall be undertaken at intervals instructed by the Engineer.

Two copies of each set of recording in Digital Video Disk (DVD) or similar format shall be delivered to the Engineer within 14 days of recording.

(b) Processing of Digital Photographs

The contractor shall, in addition pay for production, processing and printing of ten (10) copies of digital photographs taken by the Engineer.

MEASUREMENT AND PAYMENT

Add Sub-Clause (o)

(o) Video Coverage of Progress of Works and Processing of Digital Photographs

Payment for Video Coverage and Processing of Digital Photographs shall be made from Prime Cost Sum for the items allowed in the Bills of Quantities.

. **131 SIGNBOARDS**

The Contractor shall provide and erect four (4) publicity signboards on the site as directed. The minimum dimensions of the boards shall be as shown in the Drawings and as directed by the Engineer. The boards shall be prepared primed and painted cream and lettered in black. The boards shall be of stout construction, resistant to the effects of weather.

132 HOUSING ACCOMMODATION FOR THE RESIDENT ENGINEER AND HIS STAFF, OFFICE AND LABORATORY FOR THE ENGINEER WITH LABORATORY AND SURVEY EQUIPMENT AND FURNITURE

132.1 Housing Accommodation for the Engineer's Senior Staff

The Contractor shall construct, equip and maintain houses (one (1) for type I and eight (8) for type II or equivalent) for the Engineer's senior staff. The Engineer's senior staff houses shall be separate from that of the Contractor's staff housing and shall be sited and constructed to the satisfaction of the Engineer as detailed in the Drawings.

Type I and II Houses shall be in accordance with the book of drawings, and shall be constructed with material to be approved by the Engineer. The Engineer shall approve the design and construction of the same. These houses shall revert to the Contractor at the end of the project. They shall be paid for in accordance with Clause 141 of the Standard Specification, under Bill 1 of the Bill of Quantities.

All material used shall be new, strong, durable and weatherproof. Ceilings and floor must be properly insulated against heat with approved insulated material. The floor shall have a tile finish. All windows shall be glass, able to be opened, and with mosquito nets. The building materials shall be mosquito and termite proofed and painted inside and outside with two coats of paint/varnish, all to the approval of the Engineer.

The ceilings of houses and verandas shall be lined with ceiling board. All doors are to be fitted with mortise locks, which must be heavy duty on external doors. All windows shall be fitted with burglar bars.

The roof cladding shall be with G.I. corrugated sheets or equivalent material. The lounge, bedroom, bathroom, toilet and kitchen floor will have tile floors. The workbenches in kitchen shall have granite finish. All the sanitary ware shall be vitreous China or equivalent of approved quality.

All houses are to be provided with a fire extinguisher and fire axe. Fire axes are to be secured to the outside of the buildings.

All storerooms shall be fitted with at least 3 substantial shelves and kitchens shall be fitted with shelves, drawers and cupboards as instructed.

The Contractor shall provide new furniture, equipment and fittings as listed in Clause 132.3. The Contractor should obtain approval of the Engineer for the type and quality of the furniture, fittings and equipment before ordering.

All houses shall be provided with a piped supply of clean, unpolluted drinkable water suitable for bathing and for the washing of clothes. Bottled drinking water shall be provided as required on a daily basis. Electricity, gas and kerosene for the consumption of the Engineer and his staff shall be provided and the Contractor shall provide all necessary waterborne sanitation and disposal systems to the satisfaction of the Engineer.

The Contractor shall pay for water, electricity, gas and kerosene consumed, and for the statutory charges associated therewith. The Contractor shall be responsible for rubbish disposal by providing outside bins and daily collection and disposal to a central area located to the satisfaction of the Engineer.

Each of types I and II house shall be erected separately. A barbed wire topped chain link wire fence 2 metres high with a chain and padlock lockable gate shall be provided around the general perimeter of the types I and II houses.

Each of types I and II house 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 houses.

House Type I and II including furniture and fittings shall all revert to the Contractor on completion of contract. They shall be paid for in accordance with Clause 141 of the Standard Specification, under Bill 1 of the Bill of Quantities.

This senior staff will generally comprise the following:

<u>Designation</u>	<u>Number</u>
Resident Engineer	1
Highway Engineer	1
Materials Engineer	1
Engineering Surveyor	1
Road Safety Expert	1
Structural Engineer	
Environmental Safeguards Expert	
Social Safeguards Expert	

Alternatively, the Contractor, subject to the approval of the Engineer, may rent equivalent housing for the Engineer's Senior Staff.

132.2 Housing Accommodation for Engineer's Junior Staff

The Contractor shall construct, equip, furnish and maintain 16 No. Type III and 14 No. Type IV houses or equivalent for the Engineer's Junior staff, to be located adjacent to the Engineer's offices and laboratory, the location of which will be subject to Engineer's approval.

Junior staff houses shall be made in durable and weatherproof materials and to a similar standard as the senior staff houses.

House Types III and IV including furniture and fittings shall all revert to the Contractor on completion of contract. They shall be paid for in accordance with Clause 141 of the Standard Specification, under Bill 1 of the Bill of Quantities.

This staff will generally comprise the following:

<u>Designation</u>	<u>Number</u>
Junior Engineer	2
Senior Inspector	1
Inspectors	4
Lab Technologist	3
Lab technician	1
Draughtsman	1
Survey Assistant	2
Secretary	1
Office 365 assistant	1
Lab Attendant	6
Chainmen	6
Office Attendant	2

Similarly to the Engineer's Senior Staff Housing, the Contractor, subject to the approval of the Engineer, may rent equivalent housing for the Engineer's Junior Staff.

132.3 List of Equipment for Engineer's Staff Houses

Each house shall be provided with new furniture, equipment and fittings to the approval of the Engineer.

All the houses and furniture mentioned below shall revert to the contractor after the completion of the contract.

Contractor to include in their rates for the houses purchase of all the furniture listed below.

Each house shall be provided with new furniture, equipment and fittings to the approval of the Engineer as listed below:

List of Equipment and Furniture for Engineer's Staff Houses

Item No.	Description	No. of Items per House			
		I	II	III	IV
AJ. FURNITURE					
1	Kitchen table (formica top)	1	1	1	1
2	Kitchen chair	1	1	1	1
3	Dining table	1	1	1	1
4	Dining chairs	6	6	4	4
5	Dining chairs with arms	2	2	1	1
6	Writing desk (3 drawer)	1	1	1	0
7	Book shelf	1	1	1	0
8	Settee - 7 Seater	1	1	0	0
9	Settee - 5 Seater	0	0	1	0
10	Easy chairs	4	4	2	2
11	Coffee tables	1	2	1	0
12	Side board	1	1	1	0
13	Beds double 6x6 with inner spring mattresses	2	1	-	-
14	Beds single 4x6 with inner spring mattresses	1	1	2	1
15	Pillows	8	8	4	2
16	Side tables	4	4	1	1
17	Dressing tables with mirrors	1	2	2	0
18	Dressing table stools	1	2	2	0
19	Chest of drawers	3	2	2	1
20	Bedside chairs	4	2	1	1
21	Bathroom cabinet with mirror	1	1	1	1
22	Bathroom stool	1	1	1	1
23	Floor rags	4	4	4	4
BJ. EQUIPMENT					
24	Air conditioner	5	4	4	2
25	Refrigerator (at least 19 cu.ft.) including a freezer compartment of about 3 cu. ft. capacity	1	1	0	0
26	Refrigerator (at least 7 cu.ft.) including a freezer compartment	0	0	1	1
27	Electric & gas cooker with 4 burners, a grill and an oven	1	1	1	0
28	Gas or Electric cooker with 2 elements	0	0	0	1
29	Fume hood	1	1	1	0
30	Water filter (hot and cold dispenser)	1	1	1	1
31	Dust bin metal with lid(outdoor type)	1	1	1	1

Item No.	Description	No. of Items per House			
		I	II	III	IV
32	Door mats	2	2	2	2
33	Vacuum cleaner	1	1	1	0
34	Ceiling fans	2	1	1	1
35	Set of 8 piece crockery, cutlery, glass wear	1	1	1	1
36	Set of kitchen utensils	1	1	1	1
37	Set of pots and .pans etc	1	1	1	1
38	Fire extinguisher	2	2	1	1
39	Standard lamps	5	2	1	1
40	Table lamps	1	1	1	0
41	Toilet tissue holders	1	1	1	1
42	Waste baskets	4	4	2	2
43	Mixer electric (portable)	1	1	1	1
44	Bedside lights	3	2	2	1
45	Wall lights	5	12	7	3
46	Pelmets and runners	L S	L S	L S	L S

132.4 Main Office

The Contractor shall provide, erect and maintain for the duration of the Contract, a furnished and equipped main and mobile office for the Engineer's Representative of weather-proof construction, provided with mosquito-proof and burglar-proof windows and lockable doors and suitably insulated against heat and cold, all to the satisfaction of the Engineer in respect of the Construction, design and siting. The office shall comply with the details shown in the drawings and shall have a clear height of not less than 2.75m. The floor shall be of floated concrete, and adequately damp and termite-proof. Each room of the main and mobile office shall be air-conditioned with a medium size air conditioner.

A telephone shall also be provided for the Resident Engineer's main office for his exclusive use. The Contractor shall be responsible for paying all the charges and fees related to the use of the telephone and be reimbursed the same on production of proof of payment.

The offices for the Engineer's Representative shall be completely separate from that of the Contractor and, if so required by the Engineer, shall be fenced with a 2m high chain linked fence and gate with padlock and chain.

Latrines and washrooms graded to staff seniority, together with drinkable water supply and water borne sewage disposal, shall be provided for the offices. The Contractor shall also provide 24 hours a day electricity supply to the offices and shall allow for any water and electricity consumed and for any statutory charges associated.

Unless the offices are accessible via an existing paved road the Contractor shall, if so required by the Engineer's Representative, provide an access road at least 4m wide to the office, together with a 100 square meters covered car parking area. Both access road and car park shall be surfaced with at least 150mm of consolidated gravel properly graded, cambered, sealed, drained and fitted with culverts.

132.5 Main Laboratory

The Contractor shall provide, erect and maintain for the duration of the Contract, a main laboratory complying with details shown on the standard drawing, to the satisfaction of the Engineer. The laboratory shall be sited adjacent to the Resident Engineer's main office. The Contractor shall also provide a mobile laboratory at locations to be approved by the Engineer.

The main and mobile laboratory shall both have piped potable water supply and a continuous electricity supply adequate for lighting, heating and operating the laboratory equipment.

The laboratory shall have a height from floor to ceiling of not less than 2.75 metres and all rooms shall be fitted with a medium size air conditioner, and electric lighting and power points as instructed by the Engineer's Representative and each door shall be fitted with a good quality mortise lock and provided with two keys.

Soaking tanks for CBR specimens shall be provided at floor level in the main laboratory. Concrete cube curing tanks of adequate size shall also be provided. Both the CBR tanks and concrete cube curing shall have drainage pipes built in.

The following rooms and facilities shall be provided in the Laboratory:-

i) Office

This room shall have a total floor area of not less than 14 square metres and a total window area of not less than 2 square meters. The door and windows shall be fitted with fly screens covered with mosquito gauze. The floor shall be of concrete with a float finish. The walls shall be lined and ceiling provided.

A display board of soft board or similar approved material, with a minimum surface area of 3 square metres shall be provided and securely fixed to the wall.

ii) Main Laboratory room

This room shall have a total area of not less than 55 square meters and a total window area of not less than 7 square metres. The external entrance shall be a double door and single doors shall be provided for access to the adjacent offices. The external door and all windows shall be fitted with fly screens covered with mosquito gauze.

The floor shall be of concrete and float finished. The room shall be fitted out as indicated by the Engineer's Representative with three rigidly constructed work benches each minimum 2 metres long by 1 metre wide by 1 metre high and with top comprising either metal lined hard wood or steel float finished concrete at least 75mm thick and suitably reinforced, with a sink minimum size 600mm long by 450mm wide by 300mm deep fitted with a tap and waste pipe. Wall shelves, 450mm in width and having a surface area of at least 6 square metres, shall be provided and securely fitted.

Two display boards of soft board or similar approved material, each with minimum area of 3 square metres, shall be securely affixed to the walls as directed by the Engineer's Representative.

iii) Small laboratory room

This room shall have a total floor area of not less than 20 square metres and a total window area of not less than 2 square metres. The windows shall be fitted with fly screens covered with mosquito gauze. A single door shall provide access to the main laboratory room. The floor shall be fitted out as indicated by the Engineer's Representative with two rigidly constructed work benches each of minimum dimensions 2 metres long by 1 metre wide by 1 metre high with a top comprising either metal lined hardwood or a steel float concrete finish of at least 75mm thickness and suitably reinforced, with a sink of minimum size 600mm long by 450mm wide by 300mm deep fitted with a tap and waste pipe and concreted to the water supply for the main laboratory room. An approved air extractor fan shall be fitted through an outside wall.

iv) Store room

These rooms having a total floor area of not less than 20 square metres shall be provided adjacent to the main laboratory building in a position to be indicated by the Engineer.

v) Concrete Slab for Sample Drying

A reinforced concrete slab 150mm thick and of total area not less than 20 square metres shall be provided adjacent to the main laboratory building in a position to be indicated by the Engineer. The slab shall have a smooth finish to the satisfaction of the Engineer.

132.7 Engineers Office and Laboratory Furniture and Equipment

The Contractor shall provide, install and maintain in a good state of repair office furniture and equipment, and laboratory furniture and equipment, and survey equipment as outlined in this Clause 132 and in appendices to the Bill of Quantities respectively. It shall also be the Contractor's obligation to replenish consumables when instructed by the Engineer.

Resident Engineer's Main Office Furniture

As listed in Appendix to Item 1.04 of the bills of quantities.

Engineer's Main Office Equipment

As listed in Appendix to Item 1.04 of the bills of quantities.

Facilities for tea and coffee making, with sufficient crockery for all Engineers' staff including a 15 piece tea set.

All furniture and equipment bought under the Contract for the Engineer's office shall revert to the Employer at the end of the Contract.

132.8 Engineer's Office, Laboratory, and Survey Equipment

Laboratory and Survey equipment shall be of approved manufacture, and shall be available to the Engineer within the following time periods

1. *Survey equipment – not more than three (3) weeks after Engineer's order to supply*
2. *Laboratory equipment – not more than sixty days after Engineer's order to supply*

All equipment shall be ready to use and complete to perform the tests.

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 equipment shall revert to the Employer on completion of the contract while the furniture shall revert to the Contractor.

Resident Engineer's Survey Equipments

As listed in Appendix to Item 1.05 of the bills of quantities.

Resident Engineer's Laboratory Equipments

As listed in Appendix to Item 1.06 of the bills of quantities.

132.9 Communication for the Engineer

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 eight (8) mobile phone units in his rates, complete with charger unit, "hands free" headset for each unit within his rates, 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 have multi-core processors, WAP enabled with e-mail capabilities and integrated camera of a minimum of 16.0 mega pixels; with atleast 5.8" screen size, minimum 32GB storage, and 3GB memory (RAM).

Internet and email services

The contractor shall allow for the provision and maintenance of internet connectivity and associated costs as per appendix to item 1.02. Payment shall be made for under prime cost sum allowed for in the bills of quantities.

. 133 TIME FOR ERECTION OF THE ENGINEER'S STAFF HOUSES, OFFICES AND LABORATORY

Amend the following:

133.1 Completion Time

The time for the completion of the Engineer's office and laboratory shall be 60 days from the order to commence work.

133.2 Temporary Accommodation and Office for the Engineer's Staff

During the period between the Engineer's order to commence and the time at which the Contractor becomes responsible for the Engineer's accommodation, the Contractor shall provide suitable hotel accommodation and appropriately located temporary office space, all adequately furnished and equipped to the approval of the Engineer. For the Engineer's junior staff members, the Contractor shall provide housing allowances in the amounts instructed. The costs of all such temporary provision will be reimbursed under the Provisional Sum in the Bill of Quantities, expended at the Engineer's discretion, up until the end of the stipulated period within which the Engineer's office and houses are due to be provided. For any period of delay thereafter, continued provision of the temporary facilities shall be at the Contractor's expense.

. 135 MAINTENANCE OF THE ENGINEERS STAFF HOUSES, OFFICES, LABORATORIES, FURNITURE AND EQUIPMENT

The Contractor shall provide adequate security 24 hours per day until expiry of the Period of Maintenance. The costs of staff required for security and to keep accommodation facilities, offices and laboratories in a well maintained, clean and fully habitable condition, plus the costs of consumables, shall be included in the relevant items for maintenance in the Bill of Quantities.

. 137 ATTENDANCE UPON THE ENGINEER AND HIS STAFF

The Contractor shall pay wages (including all overtime) to fulfil the requirements of Clause 137 of the Standard Specification, including all allowances for the following:

<u>Designation</u>	<u>Number</u>
Junior Engineer	2
Senior Inspector	1
Inspectors	4
Lab Technologist	3

<u>Designation</u>	<u>Number</u>
Lab technician	1
Draughtsman	1
Survey Assistant	2
Secretary	1
Office 365 assistant	1
Lab Attendant	6
Chainmen	6
Office Attendant	2

The Contractor shall be paid under separate items in Item 1.17 (Attendance Upon the Engineer) of the Bill of Quantities for the wages only. Overtime will be the Contractor's responsibility and rates to be used for the payment of overtime will be the salary levels defined by the Resident Engineer for his staff.

138 PROVISION OF VEHICLES

The vehicles to be supplied will be brand new, right hand drive, diesel powered and fitted with air-conditioner and power steering as described below.

- Five (5) new 4WD station wagon vehicles of minimum 3.0 litre diesel engine, or equivalent approved, 5-door Utility Vehicle or similar approved, fitted with air bags, mobile telephone hands-free headset and 2-way radio, with full options (fully loaded).
- Fifteen (15) new 4WD Deluxe Double cabin Pick Up vehicles of minimum 2.8 litre diesel engine, or equivalent approved, fitted with mobile telephone hands-free headset and 2-way radio, with full options (fully loaded).
- Three (3) new 4WD Single cabin Pick up vehicles, or equivalent approved, (with canvas back and seat), fitted with mobile telephone hands-free headset and 2-way radio, with full options (fully loaded).

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.

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

Payment for the vehicles shall be by a rate per vehicle month for the provision of vehicles and inclusive of the first 6000 Km for the running cost per vehicle month and a rate per kilometre for the running costs, above the 6000 Km per month which shall include for all fuels, lubricants, servicing insurance, maintenance, driver and repairs. The km rate shall include for any overtime the driver might be due or any other allowances in addition to the normal working hours.

Ownership of all the vehicles mentioned above shall revert to the Contractor at the end of the contract.

In addition, the monthly rate for running costs of vehicles shall also include:

- Cost of any repairs necessary as shall be required to meet roadworthiness and compliance with registration requirements
- Any other repairs as shall be instructed by the Engineer

139 MISCELLANEOUS ACCOUNTS

The Contractor may be instructed by the Engineer 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 Bill No. 1; Preliminaries and General.

140 PAYMENT OF OVERTIME FOR ENGINEER'S JUNIOR STAFF

Delete in the last line the words "shall be at the Contractor's own expense" and substitute with "including the specified percentage for administrative overheads shall be paid by the Contractor to the Engineer".

Add the following:

- If the Contractor wishes to execute permanent work outside the Engineer's normal working hours, as stated in Clause 108 of this Specification, then the payment for the overtime for Engineer's support staff shall be reimbursed in full by the Contractor, at the rate specified by the Engineer for his staff, to the Engineer plus a 20 percent additional amount to cover for the Engineer's administrative overheads.
- In addition to the support staff provided by the Contractor, the following shall also constitute part of the Engineer's junior staff:

<u>Designation</u>	<u>Number</u>
Junior Engineer	2
Senior Inspector	1
Inspectors	4
Lab Technologist	3
Lab technician	1
Draughtsman	1
Survey Assistant	2
Secretary	1
Office 365 assistant	1
Lab Attendant	6
Chainmen	6
Office Attendant	2

- If the Contractor wishes to execute permanent works on a regular basis outside the Engineer's normal working hour, (Clause 108 of this Specifications) over a prolonged period, the Engineer may, if he deems necessary, employ additional supervisory staff for which the required salaries, plus 20 percent (20%) additional amount to cover for the Engineer's administrative overheads shall be reimbursed in full by the Contractor to the Engineer. In addition, the Contractor shall provide the required accommodation facilities for such staff at his own cost. The Contractor shall not be reimbursed for any of these costs.
- Payment of Allowance on Duty Trips

The Contractor is required to pay for hotel accommodation and allowances for his staff seconded to the Engineer on official duty trips outside the base camp. The Contractor shall not be reimbursed any of these costs.

141 MEASUREMENT AND PAYMENT

Delete Sub-Clause 141 (a) entirely and substitute with:

- No Preliminary item has been included in this Contract. All Contractor's mobilisation and general costs shall therefore be included in relevant rates in the Bill of Quantities.

- to (e): Provision and Maintenance of Housing, Office and Laboratory for the Engineer and his staff.

Replace b (i) and (ii) with the following:

The Contractor shall be paid in the following manner:

- (i) 50% (fifty percent) of the sum when the housing, office and laboratory, as appropriate, have been erected, furnished, equipped, accepted and handed over to the Engineer.
- (ii) 50% (fifty percent) of the sum in equal monthly installments spread over the period from the date when the houses, offices, or the laboratory as appropriate is taken over by the Engineer until the end of the Contract excluding the Maintenance Period.

This payment shall be deemed to cover servicing and maintenance of buildings, furniture, equipment and services and the Engineer may withhold or reduce any installments if the Contractor fails in his maintenance obligations. In the event of the Interim Certificate not being issued in any month, then the installment shall be added to the subsequent certificate.

(m) Item: Progress Photographs Delete this Sub-Clause

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).

Within four (4) weeks of the order to commence work, the Contractor shall prepare and submit a specific Environmental Management Plan for the project and his operations, relating to the approved Environmental Impact Assessment. The Environmental Management Plan shall outline potential environmental hazards and risks, and provide an action plan to deal with the hazards, minimise the risks, and mitigate adverse environmental impacts, and include a general decommissioning plan covering all relevant aspects of the project. The Environmental Management Plan shall identify monitoring indicators and reporting requirements.

The Contractor shall be required to submit environmental progress reports to the Engineer every month.

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) Payment in respect of this Clause 142 is included as a Lump Sum in the Bill of Quantities. Payment of the Lump Sum will be by equal monthly instalments over the period of the Contract excluding the Period of Maintenance. The total sum of the instalments shall not exceed the Lump Sum, and payment of the monthly instalment will only be made for that month if the Engineer is satisfied that the Contractor has fully complied with the requirements of Clause 142, otherwise the Contractor shall forfeit such instalment.

The contractor shall be required to submit an environmental progress report to the engineer every three (3) months.

143 EXTENSION OF TIME ARISING FROM ABNORMAL RAINFALL

Extension of time as provided in the General Conditions of Contract arising from abnormal rainfall shall be calculated separately for each calendar month or part thereof in accordance with the formula given below. It shall be calculated for the whole period for completion of the Contract including any extensions thereof:

$$V = (N_w - N_n) + \frac{(R_w - R_n)}{x}$$

If V is negative and its absolute value exceeds N_n the V shall be taken as equal to minus N_n .

The symbols shall have the following meanings:

V = Extension of time in calendar days in respect of the calendar month under consideration.

N_w = Actual number of days during the calendar month which a rainfall of Y mm or above has been recorded.

R_w = Actual rainfall in mm for the calendar month under consideration obtained from the Meteorological Department of the Ministry of Water, Lands and Environment, or from a source agreed to in writing by the Engineer.

N_n = Average number of days, as derived from the existing rainfall records of the Department of Meteorology provided in the Special Specifications, or as agreed to, in writing by the Engineer, on which a rainfall of Y mm or more has been recorded for the calendar month.

R_n = Average rainfall in mm for the calendar month, as derived from the rainfall records of the Department of Meteorology provided in the Special Specifications, or as agreed to, in writing, by the Engineer.

x = 20 unless otherwise provided in the Special Specifications.

Y = 10 unless otherwise provided in the Special Specifications.

The total extension of time shall be the algebraic sum of the monthly totals for the period under consideration. Extensions of time for part of a month shall be calculated using pro rata values of N_n and R_n .

The factor $(N_w - N_n)$ shall be considered to represent a fair allowance for variations from the average number of days during which rainfall exceeds Y mm.

The factor $(R_w - R_n)/x$ shall be considered to represent a fair allowance for variations from the average in the number of days during which rainfall does not exceed Y mm but wet conditions prevented or disrupted work.

Information regarding existing rainfall records, if available from a suitable rainfall station near the Site, will be supplied in the Special Specifications together with calculations of extensions of the time for previous years in accordance with the above formula.

If no suitable rainfall records are available, the above formula will not apply, and rain gauges shall be installed by the Meteorological Department at locations approved by the Engineer. These shall include all sections where the Contractor is working including Borrow Pits. All readings shall be taken by the Meteorological Department and agreed jointly with the Engineer on a daily basis.

As soon as is practicable after the end of each month, the Contractor shall collect daily records for that month and shall calculate V for that month, as specified. The records and calculations shall be submitted to the Engineer without undue delay.

No separate payment shall be made to the Contractor in respect of, the requirements of this Clause, and the resultant extension of time, and the Contractor shall allow for any related costs elsewhere in his/her rates

SECTION 2 - MATERIALS AND TESTING OF MATERIALS

. **202 TESTING BY THE CONTRACTOR**

Add the following:

202.1 Contractor's Testing

The provision of the Engineer's laboratory and testing equipment, as specified in Section 1 of this Special Specification, does not relieve the Contractor of his obligation to provide laboratory and testing equipment and execute his own testing, in conformity with the specified requirements in the Standard Specification.

. **204 SIEVES**

In the standard sieve series, delete the size of the greater sieve "75"mm and replace by a "100" mm size.

. **205 SOILS AND GRAVEL**

Whenever in the Contract Documents, a minimum California Bearing Ratio (CBR) is specified, the CBR of the material shall be determined at the specified degree of compaction.

- (i) After four days soaking in the case of neat materials and,
- (ii) After seven days curing plus seven days soaking in the case of cement/lime improved materials.

. **207 Ordinary & Rapid Portland Cement**

In addition to the requirements of clause 207 of the standard specifications, Ordinary and Rapid setting Portland cement shall be sampled and tested in accordance with, and shall comply with the latest equivalent revised standards.

. **211 BITUMINOUS BINDERS**

(a) Requirements

Straight run bitumen in addition to the requirements of the Standard Specification the ash content of penetration grade bitumen shall not exceed 0.5% by weight.

(b) Types of Bitumen

Prime coat shall be type MC 70 unless otherwise stated. Tack coat shall be K1-70 emulsion. For surface dressing the binder shall be 80/100 bitumen.

. **224 TRIAL SECTIONS**

The Contractor shall allow in his programme for the construction of trial sections and carrying out tests upon them as directed by the Engineer. The time of completion of the contract shall not be extended because of the time taken to carry out tests and evaluate trial sections.

No variation in the construction procedure, mix proportions, spray or spread rates, size, grading or source of any constituents shall be made without the approval of the Engineer.

. **226 FREQUENCY OF TESTING**

Add the following:

226.1 General Acceptance Criteria for Test Results

Conventional statistical techniques shall be used alongside the above said criteria (where applicable).

. **227 MEASUREMENT AND PAYMENT**

No additional measurement and payment will be made for testing of materials, trials, etc, in conformity with the standard specification.

. **228 WORKMANSHIP AND QUALITY CONTROL**

The Contractor shall, not later than 4 weeks after the notice to commence the Works, submit a project specific Quality Management System, including the Work Method Statements and Quality Audit for major items of work, showing how all the Contractor's systems will ensure that all the works will conform to the Contract documents. The onus rests with the Contractor to produce work which conforms in quality and accuracy of detail to all the requirements of the Specifications and Drawings, and the Contractor shall, at his own expense, institute a quality control system and provide experienced engineers, foremen, surveyors, materials technicians, other technicians and other technical staff, together with all transport, instruments and equipment, to ensure adequate supervision and positive control of the Works at all times. The Contractor shall provide chainmen and labourers as necessary for the Engineer to carry out checks on the Works.

The Contractor shall conduct tests or have them conducted continually on a regular basis, to check the properties of natural materials and processed natural materials and of products manufactured on the site, such as concrete and asphalt. The Contractor shall remain fully responsible for any defective material or equipment provided by him. Similarly, the quality of all elements of the Works shall be checked on a regular basis so as to ensure compliance with the specified requirements.

The intensity of control and of tests to be conducted by the Contractor in terms of these obligations shall be adequate to ensure that proper control is being exercised.

Where any natural materials or products made from natural materials are supplied, and upon completion of each element of the construction work, the Contractor shall test and check such materials, products and/or elements for compliance with the specified requirements and shall submit his results to the Engineer for approval. Such submission shall include all his measurements and test results and shall furnish adequate proof of compliance with the specified requirements.

No specific pay items are provided as compensation for the above obligations, including the provision of all samples delivered to the Engineer, the repair of places from which samples were taken, and the provision of the necessary personnel and testing apparatus and facilities, for which compensation shall be included in the bid rates of the Contractor for the various items of work to which these obligations apply.

The Contractor shall submit to the Engineer for examination, the results of all relevant tests, measurements and levels indicating compliance with the Specifications on completion of every part of the Work.

SECTION 3 - SETTING OUT AND TOLERANCES

. 301 SETTING OUT

1. Add the following to **(a) General**

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 shall 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. The 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 reference points to define the road reserve shall have 12 mm diameter steel pins embedded in concrete, 200 mm long with 25 mm exposed to the air, sticking out from its top surface. This pin shall be co-ordinated and heighted and the result of the same shall be provided to the Engineer for approval. The cost of these works shall be included in the Contractor's unit rates for other items, as no separate payment item has been provided in the Bill of Quantities.

Commencement of the Works shall not be permitted until this basic survey data has been provided and approved by the Engineer for at least 5 km of the road.

2. Add the following to **(b) Detailed Setting Out**

Reference pegs shall be 50 mm by 50 mm in section 600 mm long driven 400 mm firmly into the ground and painted white above the ground. The offset from centerline shall be indicated by a small nail 20 mm to 25 mm long with its head driven flush with the top of the peg. Chainages, offset and reference elevation shall be clearly indicated on the sides of the pegs to the satisfaction of the Engineer.

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

. 302 TOLERANCES

Add the following:

Pavement Widths

For Pavement widths for subbase, base and binder course, the allowable tolerances shall be -0 to +50 mm.

(k) Pipe Culverts

The maximum deviation from the specified line of a drainage pipe shall be: -

Horizontal	-20 mm in 3.0 m
Vertical	-30 mm in 10.0 m

. 305 AS BUILT DRAWINGS AND MAINTENANCE MANUALS

Prior to the issue of a Taking Over Certificate the Contractor shall provide three (3) electronic copies of as built drawings, and where appropriate, maintenance manuals showing the Works as constructed, and details of the correct operation and maintenance of ancillary Works. No separate payment shall be made for this requirement, and costs for compliance shall be deemed to be included in the Contractor's general rates and prices.

SECTION 4 - SITE CLEARANCE AND TOP SOIL STRIPPING

. 401 SITE CLEARANCE

The Contractor's attention is drawn to the requirements of Clause 142 regarding preservation of existing trees and native shrubbery and vegetation, and environmental requirements generally.

Site clearance is to be confined within the road reserve, and site clearance is not required over the existing road. The remaining area required for construction purposes, including sides of existing embankments and cuttings shall be cleared as instructed by the Engineer. Generally, light clearance shall be done on areas covered by grass and light thickets while heavy clearance shall cover sections in dense bush.

Site clearance of areas necessary for the execution of the contract, outside the road reserve, and for quarries, borrow pits, stockpiles, spoil tips, haul roads and deviation roads, will be subject to the approval of the Engineer, but shall be the responsibility of the Contractor, and no separate payment will be made.

. 402 REMOVAL OF TOPSOIL

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

. 403 REMOVAL OF STRUCTURES, FENCES AND OBSTRUCTIONS

Items have been included in the Bill of Quantities for the removal of existing pipes, inlet and outlet structures for pipe and box culverts and existing concrete structures, stone, precast paving blocks and invert block drains. plus loading, transport and unloading it at the KURA offices in Meru.

When instructed by the Engineer, the Contractor shall demolish or remove other additional structures or obstructions.

Measurement and payment for removal of obstructions and structures shall be made against the quantities provided in Bill No.4 of the Bill of Quantities or day works basis as directed by the Engineer.

SECTION 5 –EARTHWORKS

. 501 SCOPE OF SECTION

The scope of this section includes all earthworks associated with the Contract. This includes but not limited to roadside amenities, cycle paths, footpaths, and widening at trading centres.

. 503 CLASSIFICATION OF MATERIAL

Add the following to **(a) Hard material:**

Hard materials include materials which require drilling and blasting to enable removal.

Add the following to **(b) Soft material:**

Unsuitable materials include:

- (i) All material containing more than 5% by weight of 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%.
- (iii) All clay of plasticity index exceeding 45 or of liquid limit exceeding 70.
- (iv) All material having moisture content greater than 105% of optimum moisture content (AASHTO T99)

. 504 PREPARATION PRIOR TO FORMING EMBANKMENT

Add the following at the end:

Where benching is required to 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 in embankments.

Material with high swelling characteristics or high organic matter content and other undesirable material shall not be used, unless specifically authorized by the Engineer.

Unsuitable material shall include:

- *Material containing more than 5% by weight of organic matter, such as topsoil, humus, material from swamps, mud, log stumps and perishable material.*
- *Material with a swell of more than 3%*
- *Clay with a liquid limit exceeding 50%*

- *Material having a moisture content greater than 105% of optimum moisture content (standard compaction) in its naturally occurring state.*

Fill material shall comply with the following requirements:

- *Organic matter less than 5% by weight*
- *Swell less than 2%*
- *Plasticity Index less than 45%*
- *CBR : minimum 5% (at 100% MDD AASHTO T99 – 4 days soak)*

Removal and replacement of unsuitable material

The requirements for the backfill material that replaces the unsuitable material (not improved subgrade) shall be as follows:

Permeability: Coefficient of saturated permeability (k) not to exceed 5×10^{-7} cm/sec at 95% AASHTO T99 or the anticipated or actual field density, when tested according to AASHTO T 215 or another approved method using a similar grading to that achieved on the road after compaction. The permeability shall also be checked on the road using a suitable field test at least at each change of material.

Atterberg limits and grading (after compaction):

- Maximum Size: 75mm or 0.4 of compacted layer thickness, whichever is the greater*
- Liquid limit: 25-45*
- Plasticity Index: 10 (12 preferred) – 25 (20 preferred)*
- Weighted Plasticity PI: 500-2000%*
- Casagrande plot: above the A-line*
- Material passing the 75 μ m: 8-15 minimum, depending on grading*
- CBR at 100% AASHTO T99: >4%*
- CBR swell at 100% AASHTO T99: <2%*

Compaction shall be in 150 or 200 mm lifts of compacted thickness to at least 95% (AASHTO T 99) in general and at least 100% in the upper 150-200mm. The maximum compacted thickness shall additionally be limited to two-thirds of the length of the feet of any tamping roller used.

Stockpiling of unsuitable material

All unsuitable material excavated from the road prism and from beneath embankment positions shall, insofar as practicable, be used for the flattening of slopes to embankments as shown on the drawings or as directed by the Engineer.

The Contractor shall not dispose of any excavated material from the road prism without the approval of the Engineer. Excavated material, which is unsuitable for use in any part of the works, shall be disposed of at points approved by the Engineer and in a manner satisfactory to him.

Unsuitable material to be reserved for later use in flattening the slopes of the embankment shall be loaded, transported and temporary stockpiled longitudinally and on both sides of the proposed road in approximate equal quantities, as shown on the drawings and as ordered by the Engineer.

The Engineer will, in ordering the locations for temporary stockpiling of unsuitable materials, ensure that full and free access to the works area will be maintained at all times.

Improved Subgrade Material

Improved subgrade layer is defined in Section 102, Permanent Works (g), where it is designated as S4 and on the Drawings and shall comply with the following requirements:

1. *CBR of not less than 15% measured after 4 day soak on a laboratory mix compacted to a dry density of 100% (AASHTO T99)*
2. *Plasticity Index less than 25%*
3. *Swell less than 1% on the laboratory mix sample.*
4. *Maximum Dry Density (MDD) not less than 1500kg/m³*
5. *The upper layer of the earthworks (350mm) should be of Class S4 with a minimum CBR of 15% at 100% MDD AASHTO T99*

Improved Subgrade shall mean the upper 350mm of earthworks, either cut or in fill and subgrade shall be provided as part of the earthwork operation, and payment shall be made as fill.

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

Fill above ground level around pipe culverts shall be compacted to a field density of 100%MDD (AASHTO T99) 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.

Adjacent to structures, all fill above ground level up to the underside of the subgrade shall be compacted to density of 105% MDD (AASHTO T99). 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 wing walls.

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. Clauses in the Specifications applying to normal subgrade shall also apply.

509 MASS-HAUL DIAGRAM

Replace the first sentence of the last paragraph by the following:

The mass haul diagram is drawn in "cut" on the basis that 1m³ of material obtained from cuttings will produce an equal volume of material when compacted in fill.

510 SPOIL MATERIAL

The Contractor's attention is drawn to the requirements of Section 6 of this Specification.

Where possible, spoil material is to be utilised in the backfill and restoration of borrow pits and quarry areas.

. **511 BORROW PITS**

Replace the first two paragraphs by the following:

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 and approved by the Engineer.

. **514 TOPSOILING AND GRASSING**

Topsoiling and grassing shall be to all areas instructed by the Engineer. Topsoiling and grassing of spoil, borrow, stockpile and quarry areas, including payment thereof, shall be in accordance with Section 6 of these Specifications.

. **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 this Special Specification and no extra payment shall be made for compaction around pipe culverts.

(e) Re-place this sub-clause with the following:

No separate payment whatsoever shall be made for haulage or overhaul of materials, and the Contractor shall ensure that he has included in his unit rates for each and every item, as appropriate, for all necessary haulage and associated costs. The Contractor's unit rates shall be deemed to adequately cover for all materials handling and haulage necessary from/to borrow areas, spoil areas, and/or stockpiles, as appropriate.

The rate for cut to spoil shall also allow for cutting to spoil in any waterlogged areas.

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

. 603 GENERAL

Notwithstanding any indications to the contrary in the Standard specification the Engineer will not make available to the Contractor any land for, nor has identified any specific areas for, quarries, borrow pits, stockpiles and spoil areas, and for access thereto, 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, winning, 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.

Quarries, borrow pits, stockpile and spoil areas shall be progressively restored as the works progress once their use is no longer required.

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

. 605 SAFETY AND PUBLIC HEALTH REQUIREMENT

Add the following to Clause 605:

When working the material sites, the Contractor shall time and arrange his works in such a way that at no time is the public safety endangered in any way.

. 607 SITE CLEARANCE AND REMOVAL OF TOPSOIL AND OVERBURDEN

Add the following to Clause 607:

Faces of quarries being higher than 4 metres shall be shaped to 1:10 out of the face. All quarries and borrow pits shall be permanently fenced with 5 strand barbed wire which shall be located 5 metres off the edge of the face. After reinstatement, the bottom of a quarry shall be covered with 0.20 m of soil and 0.15 m of topsoil.

. 611 OBTAINING OF BORROW MATERIALS

(a) Borrow Pit Locations

Borrow materials shall be located and obtained by the Contractor. Borrow materials shall comply with the requirements of the appropriate Specifications according to the use for which the material is intended.

The Contractor shall search for and test all possible sources of borrow material including any possible sources so designated by the Engineer, within an economic distance of the location where the borrow material is to be utilized.

The Contractor shall excavate the necessary trial holes, take such samples and perform such tests as are deemed necessary by the Engineer. The Contractor shall submit all the results to the Engineer in

sufficient detail to satisfy him that the quality and quantity of material available in the proposed borrow area are acceptable for the intended use, all at the Contractor's expense. The Contractor shall propose the use of those borrow pits which will be most economic to the Employer.

Approval of borrow pits or borrow areas shall apply only to those portions of the pit or area from which acceptable materials can be obtained or produced. The Contractor shall conduct his operations in any approved pit or borrow area or portions thereof so as to produce acceptable material.

Any approval given by the Engineer shall not relieve the Contractor of the responsibility of ensuring that material obtained from a borrow pit or area complies in all respects with the specification for the material.

The Contractor shall plan his exploitation of borrow pits in such a manner that the various materials excavated can be selected and either loaded directly for use or pushed to stockpile in a borrow area for later loading. When this is not feasible for reasons beyond the Contractor's control, material to be reserved for later use shall be loaded, transported and temporarily stockpiled as ordered by the Engineer at locations outside the borrow area indicated by him and such temporary stockpiling shall be measured and paid for as Dayworks. No material reserved for a specific purpose shall be used for other purposes without the written approval of the Engineer.

612 OPENING AND WORKING OF BORROW PITS

a) Clearing and Grubbing, Topsoil and Overburden

The Contractor's rate for borrowed material must include for clearing and grubbing and the removal of topsoil and overburden. No separate payment will be made for this work.

b) Excavation of Borrow Material

Where any borrow pit contains different types of materials, in separate layers which require to be mixed in order to produce a suitable product, the materials shall be excavated over the full depth of approved face in one operation without separation of the different types of material.

The Contractor shall exercise all reasonable care so as to avoid contamination of approved borrow material by the inclusion of clayey or otherwise unsuitable material from the floor of the borrow pit, from overburden, from unsuitable layers or from areas beyond the approved limits of the borrow area. During loading hard oversize material which will not break down during processing on the road shall be excluded as far as is practicable.

During the course of borrow operations and especially when excavating near the floor and outer boundaries of borrow areas, the Contractor shall plan his operations so as to reduce as far as possible the amount of earthmoving that will be necessary for the reinstating of borrow pits. Indiscriminate excavation without due regard for the desired final shape of the borrow pit will not be permitted.

The material in borrow pits shall be blasted or ripped and/or excavated in a manner that will ensure the effective breaking down of the material in the borrow pit before it is loaded. Rippable material which tends to break into large blocks shall be cross ripped.

c) Quality Control at Borrow Pit

The Contractor shall be responsible for controlling his operations at every borrow pit where material is being excavated, to ensure compliance with the requirements of Sub-section (b) above.

He shall carry out sufficient tests on the material being excavated from the borrow pit in order to satisfy himself that the quality of the material will comply with the specified requirements for the particular layer for which it will be used.

(d) Protection of Borrow Pit

Borrow pits shall be continuously protected against the ingress of surface water and the Contractor shall construct such temporary banks as may be required to divert surface water and as far as possible his operations shall be planned in such a way that the borrow pit is self-draining. Where this is not possible, borrow pits shall be dewatered by pumping. The Contractor shall be solely responsible for keeping borrow areas dry and ensuring that borrow material is sufficiently dry when required for use.

613 REINSTATEMENT OF BORROW AREAS

On completion of his operations in a borrow area, the Contractor shall reinstate the entire area so as to blend with the surrounding area and to permit the re-establishment of vegetation. For this purpose the borrow area shall be shaped to even contours. All material in and around the borrow area, whether spoil from road building operations, excess stock-piled material, oversize material left in the borrow pit, material resulting from clearing and grubbing operations and excess overburden, shall be used or disposed off as directed by the Engineer. Material not capable of supporting vegetation shall be buried and used in shaping the borrow area and subsequently covered with soft material. All available soft material shall be spread evenly to the thickness directed and where sufficient material is not available for this purpose to cover the entire area, the remaining portions shall be scarified along the contours so as to avoid undue erosion.

All haul roads shall be obliterated and the surface scarified, earth banks constructed to prevent erosion and all damaged fences and other structures reinstated.

The shaping and reinstatement of the borrow pit shall be done in such a way that the borrow pit will be properly drained whenever practicable and where required, the Contractor shall place earth banks to divert any surface water away from the borrow area.

The reinstatement of any borrow pit shall be to the entire satisfaction of the Engineer and the Contractor shall submit to the Engineer a signed certificate from the landowner stating that he is fully satisfied with the reinstatement of any borrow area.

614 DISPOSAL OF BORROW MATERIAL

The Contractor shall not have the right to use material obtained from borrow pits for any purpose other than for the execution of this Contract. He shall not dispose off any borrow material whether processed or not either by sale or donation to any person without the written authority of the Employer.

615 MEASUREMENT AND PAYMENT

Clause 610 of the Standard Specification shall apply.

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 T99) immediately before structures are constructed.

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

. **707 BACKFILLING FOR STRUCTURES**

All backfilling material shall be selected backfill complying with the requirements for a natural subbase material given in Clause 1203. Unless otherwise instructed by the Engineer, all backfilling material shall be compacted to a minimum of 100% MDD (AASHTO T99).

Porous filter material shall be clean, uniform, sand or crushed aggregate with a d₅₀ between 0.4mm and 1.2mm and less than 5% particles finer than 75 micron sieve. The d₁₀₀ must be lower than 5mm.

Selected rock backfill shall be a hard durable crushed rock supplied and placed in accordance with Clause 507 of the Specifications.

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

Add the following:

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 thick bedded on 50mm mortar bedding with all joints grouted for the full depth of the joint. Grouting will be done for all stone pitching areas and the top line of the stone pitching should be grouted/sealed with concrete class 15/20.

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. Soil erosion is rampant along the project location and this can be minimised by ensuring that proper protection works is carried out along the drains using stone pitching. Most of the sections shall be stone pitched especially areas where we have steep slopes to minimise undermining of the road by rain water or as may be instructed by the Engineer.

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 in-situ material immediately behind the pitching shall be compacted to minimum density of 100% MDD compaction (AASHTO T99).

711 PROTECTION OF EMBANKMENTS AND OR RIVER BANKS

Where instructed by the Engineer, the Contractor shall install gabions as protection works to washout areas or embankment and/ or river banks. Gabions shall be constructed in accordance with Clause 711 of the Standard Specification.

712 RIP-RAP

Add the following at the end:

Quarry waste or similar approved material shall be used to backfill 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.

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 in-situ material immediately behind the pitching shall be compacted to minimum density of 100% MDD compaction (AASHTO T99).

713 FILTER FABRIC

Where filter fabric is specified, it shall be durable non-woven geotextiles or synthetic fibres, unaffected by soil acidity, soil alkalinity and bacteria. The fabric shall be made by an approved, reputable manufacturer and shall have a mass and strength at least equal to 280g/m²

The mesh size of the fabric shall be sufficient to effectively retain the material on which it is placed but shall not be greater than 150 microns. The fabric shall be installed in accordance with the manufacturer's instructions. The fabric shall be placed on levelled ground, with sharp rocks and other objects which are likely to damage the fabric being removed and all pits and depressions being backfilled and compacted.

The fabric shall be overlapped by a minimum of 300mm and stitched at joints in such a manner that the strength of the joints is at least 50% of the strength of the fabric.

Rip-rap or gabions or other materials, as applicable, shall be placed carefully on the filter fabric in such a way as to avoid damage to the fabric. In any event construction procedures shall ensure no damage to the filter fabric or impairment of its design function. Should the filter fabric be damaged, it shall be replaced, including removal of the overlay material, in a manner approved by the Engineer, and at the cost of the Contractor.

No mechanical plant shall traffic over filter fabric unless a minimum thickness of 200mm of fill material has been placed over the fabric.

713 MEASUREMENT AND PAYMENT

Add the following:

Measurement and payment for gabions boxes and gabion mattresses shall be by the cubic metre of rock fill contained within the boxes and mattresses, and the rate shall include for the cost of providing and fixing the mesh, and the cost of providing, hauling and placing the rock, and all the costs of complying with the requirements of Clause 711 of this Specification.

Item: Drilling of holes (diameter and type of drilling indicated)

Unit: m

The bid rate shall include full compensation for establishment on the site, moving to individual bridge positions and the subsequent removal of all special plant for drilling the holes and additional plant for carrying out operations drilling and clearing the holes as specified, equipment moving and setting up in position, drilling and clearing the holes as specified.

Item: Grouting (type of grout and for which purpose it is required indicated)

Unit: kg

The unit of measurement for grouting shall be the kilogram of cement or proprietary brand of grout mix as may be applicable used in the grouting operation.

The bid rate shall include full compensation for providing the equipment and all the material, and mixing and pumping the grout into the prepared holes in accordance with the instructions of the Engineer, and also for the water-pressure tests

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.

The rockfill shall be placed in layers not less than 0.50m in compacted thickness, each compacted to refusal by vibrating roller, finished with non-plastic fines as specified in the standard specification till all voids in the layer have been filled which will be indicated by appearance of no more swallow holes under vibrating roller at refusal, prior to placing of the next layer all to Engineer's approval.

SECTION 8 - CULVERT 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: -

- Replacement of all the existing 600mm cross pipe culverts by 900mm diameter
- Installation of 900mm and 1200mm in new locations
- Provision of access culverts

. **804 EXCAVATION FOR CULVERTS AND DRAINAGE WORK**

The Standard Specifications are amended as follows:

- 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 Drainage Structures

Where instructed by the Engineer, the Contractor shall demolish or remove any existing drainage structures obstructing the works.

The payment of this work shall be per linear metre of pipes removed, provided under relevant item of Bill No. 4.

Regarding backfill reference is made to Clause 812

- c) Removal of Other Existing 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 2, 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 T99)".

Hard material is material, which can be excavated only after blasting with explosives and wedging or the use of a mechanical breaker fitted with a rock point in good condition and operated correctly. Boulders of more than 0.2m³ occurring in soft material shall be classified as hard material.

. **807 CONCRETE PIPES**

Precast concrete pipes shall be reinforced, and shall comply with the requirements of AASHTO M170

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

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

- a) In addition to the requirements of the Standard Specification, where inflatable balloon method of casting culverts in-situ is used, thorough pre-construction trials shall be carried out to ensure, to the satisfaction of the Engineer, that the Contractor provides a suitable alternative to the provision of precast concrete pipe culverts, and that the inner concrete barrel surface will achieve a Class F3 finish. The pipe trench shall be excavated to the exact width required by the drawings and concrete surround and bedding shall extend to this width. Any over-excavation shall be filled with surround or bedding concrete, as appropriate, at the Contractor's expense.

. **810 JOINTING CONCRETE PIPES**

Amend as follows:

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.

Payment shall be included in the relevant item under Bill of Quantity No. 8.

. **811 CONCRETE BEDS, SURROUNDS AND HAUNCHES**

Concrete shall be Class 15/20 for surrounds and haunches for precast pipes, and Class 25/20 for cast in-situ pipes where inflatable balloon are used.

. **812 BACKFILLING OVER PIPE CULVERTS**

In the Standard Specifications, Clause 812

- a) delete paragraph 6 " for pipe culverts ...depth of 150mm", entirely.
- b) Wherever the expression "dry density of 95% MDD (AASHTO T99)" occurs delete and replace with "dry density of 100% MDD (AASHTO T99)".

All material for backfilling shall be a natural gravel subbase material complying with the requirements of Clause 1203.

The rates entered for laying of pipe culverts shall allow for backfilling to pipe culverts and compacting to 100% MDD (AASHTO T99) and these works shall not be measured and paid for separately.

. **813 PRECAST CONCRETE OPEN CHANNELS**

Add the following to the Standard Specification clause 813:

813.1 Half Round Open Channels

These shall be provided as directed by the Engineer and in compliance with sections 813 and 820 of the Standard Specification.

Payment shall be according to Bill of Quantity No.8.

813.2 Invert Block Open Channels

These shall be provided as directed by the Engineer and in compliance with sections 813 and 820 of the Standard Specification.

Where and as directed by the Engineer, the Contractor shall excavate in any material provide and place concrete for the bedding, backfill and remove surplus material to spoil, provide, lay and joint precast concrete invert blocks, side slabs, slotted drains and gulley chambers.

Precast concrete invert block side drains and gulley chambers shall comply with the requirements of BS 338, and shall be laid in accordance with the drawings.

All slabs to be concrete Class 25/20.

. 814.1 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 stabilised gravel and surfaced with hot asphalt or a surface dressing as instructed by the Engineer

. 814.2 FILTER FABRIC TO SUBSOIL DRAINS

A filter fabric shall be placed under, around and over rock fill of the subsoil drains. The provisions and placing of the fabric shall be in accordance with manufacturer's instructions and complying with Clause 804 and 814 of the Standard Specification. Payment shall be in metre square of the fabric used.

. 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 drains 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.

- (c) Shaping the drains to free flowing condition as directed by the Engineer.

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 25/20 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 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 specification, unless suitable for re-use, and deposit of the material in a spoil dump to be approved by the Engineer.

- . **818 SCOUR CHECKS**

In the Standard Specifications, clause 818 paragraph 2, delete "Class 20/20" and insert "Class 25/20".

- . **819 CLEANING AND MAINTENANCE**

Add the following:

819.1 De-silting of Pipe Culverts

Where instructed during the life of the project, the Contractor shall desilt the completed pipe and box culverts by removing all the material from the culverts to make them clean and free flowing.

No separate payment will be made for such work.

- . **821 INVERT BLOCK DRAINS**

Where instructed, the Contractor shall excavate, compact the excavated bed to 100% MDD AASHTO (T99), backfill as necessary with selected material compacted to 100% MDD AASHTO (T99) lay and joint invert block drains of 300mm diameter with two side slabs.

Payment for laying invert block drains of 300 mm diameter inclusive of two side slabs shall be by linear metre laid as instructed. The rate shall be inclusive of provision and transport of all materials, excavation, bed compaction and preparation, laying, jointing and disposal of spoil.

- . **823 PEDESTRIAN SLABS OVER OPEN DRAINS**

Pedestrian slabs shall be 3.0m long x 1.2m wide x 150mm thick concrete Class 25/20, reinforced on the bottom face with 12mm diameter high yield deformed bars to form a mesh with 200mm centres in both directions. They shall be mortared bedded on a 300mm x 300mm stone masonry plinth extending for the width of the slab. Measurement and payment shall be by the number, which includes all preparation, casting (including supply and placing reinforcement), transporting and placing the slab, and construction of the masonry plinth.

SECTION 9 – PASSAGE OF TRAFFIC

. 901 SCOPE OF THE SECTION

Add the following paragraphs (f) and (g): -

(f) Traffic Control Plan

Following the award of the contract, the Contractor shall submit to the Engineer a detailed Traffic Control Plan. Such plan shall be approved by the Engineer, and where necessary, by the appropriate statutory authority, before the Contractor commences work. The plan shall cover but shall not be limited to, the method of protection of the public and give details of the duration and hours of operation, location, type and numbers of traffic safety devices, barricades, warning signs, flag men equipped with two way radios and the like. The Traffic Control Plan shall be in accordance with and complimentary to the Programme of Works submitted under Clause 104.

In the preparation of this Traffic Control Plan, the Contractor shall take into consideration the following:

- a) The Contractor shall conduct his operations in such a manner that no greater length or amount of work is undertaken than he can efficiently carry out having due regard to the rights and conveniences of the public and the requirements of this Section.
- b) If the Contractor proposes closure of a road, he shall provide an alternative routing of the traffic, which must be approved by the Engineer.
- c) No revisions shall be made to the Traffic Control Plan without the prior written approval of the Engineer and the Contractor shall allow fourteen (14) days for the Engineer to review any request for revision of the Traffic Control Plan.
- d) The Traffic Control Plan shall conform in all respects with the requirements of this Specification.

(g) Standard of Works

- i). The standard of all works carried out under this Section shall comply with the requirements of the appropriate sections of these Specifications.
- ii). All provisions for traffic and the standard of temporary traffic surfaces shall comply with the requirements of Clause 904, and Section 9 generally, of these Specifications and any damage caused by passing traffic through the works shall be made good at the Contractor's own cost.

. 902 IMPROVEMENTS TO EXISTING ROADS

Insert the following below the heading of section 902 of the Standard Specification: -

The employer shall hand over whole road between **3 Steers -Kambakia - KeMU, Runogone- Kaithe, Hospital Roads and Western Bypass – Mate road** for expansion and maintenance by the Contractor at the commencement of the contract.

Add the following paragraph (j) immediately below paragraph (i):-

Extent of Improvements to Existing Roads

Where instructed by the Engineer, Contractor shall improve the existing roads by:-

- i). Providing material similar to those used for earthworks and pavement layers, building up the shoulders so that any irregularities and drops between the edge of the shoulder and carriageway are eliminated. The Contractor shall scarify the existing shoulder, trim and compact the existing surface, and, where directed by the Engineer, bring in additional materials for pavement layers, spread and compact to required thicknesses and tolerances
- ii). Repairing of potholes and edge breaks in the existing road with cement stabilised natural gravel base material and asphalt concrete. The work shall include, but not limited to, building up existing shoulders and deviations with approved material, excavating and squaring around the pothole or edge break, removing deleterious material, compaction and priming of the exposed surface, compaction and filling with natural gravel base material as directed by the Engineer.
- iii). Scarifying or removing sections of the existing pavement surface, where directed by the Engineer, bringing in additional natural subbase or base quality material where required, reshaping and compaction to required thicknesses and tolerances. The surface shall then be primed and blinded at the primer rate of 1.0 litre/sq. metre, and a single bituminous surface seal treatment application of 10/14mm chippings at 80m²/m³ with bitumen rate of 1.4 litre/sq. metre or such other rates as instructed by the Engineer.
- iv). Providing standard warning and direction signs. Payment will only be made for traffic warnings and signs associated with the improvement of the existing road ahead of the works

Existing bituminous pavement material which has been removed shall be stockpiled for future reuse or spoiled, as directed by the Engineer. The Contractor shall improve the existing road in a progressive and logical sequence to a standard acceptable by the Engineer. When a satisfactory standard of improvement has been achieved, the Contractor shall subsequently maintain the road to this standard in accordance with Clause 903 of the Specifications. The cost of maintenance thereof shall be paid for under the relevant item allowed in the Bills of Quantities for maintenance of passage of traffic.

903 MAINTENANCE OF EXISTING ROADS

The Contractor shall maintain the existing road between **3 Steers- Kambakia- KeMU, Runogone – Kaithe, Hospital roads and Western Bypass -Mate** at the commencement of the contract. The Contractor shall be responsible for maintenance of the existing road for the duration of the contract and shall regularly inspect the road and carry out repairs and maintenance to the satisfaction of the Engineer and ensure that appropriate resources are continuously available to satisfy the requirements of this Clause.

If at any time the Engineer draws the Contractor's attention to a road section which requires maintenance the contractor shall promptly repair and maintain the section. The Contractor shall be legally liable for any accident or third party damages attributable to his failure to maintain the road in accordance with instructions and provisions of this section.

904 CONSTRUCTION OF DEVIATIONS

In addition to requirements of clause 904 of the Standard Specification, the following shall apply:

(a) General

The maximum length of deviation of road shall be restricted to 1.5 kilometres at any one time unless otherwise instructed. The Contractor shall construct and complete deviations to the satisfaction of the Engineer before commencing any permanent works on the existing road.

The Contractor shall be allowed to open further 1.5 kilometre section of deviation road only when 80% of permanent works have been completed on the first (or previous section) of the main road, provided further that the contractor will not be allowed to open to traffic deviations corresponding to the subsequent 1.5 kilometre section of the main road until he has completed permanent works on the previous 1.5 kilometres of the main road and has it opened to traffic.

Where an old road exists near the main road, Contractor shall use this road as the deviation road, following improvement in accordance with clause 902.

The Contractor shall continually maintain deviations such that a travel speed for all vehicular groups of at least 40km/hr is provided on a surface which is smooth, free from ruts, potholes, loose material, and dust, and which is regularly graded and watered.

(b) Geometry

The carriageway width of the deviations shall be 7m wide and suitable for 2-way lorry traffic unless otherwise specified. For the deviation of a minor public road or a private road, the width of the temporary carriageway shall be the same as the existing carriageway, or such lesser width as agreed by the Engineer,

Where in the opinion of the Engineer, it is impracticable to provide a two-lane deviation, a single-lane carriageway not less than 3.5 m wide with traffic control and passing places shall be provided if possible.

The verges of the deviation shall be cleared and maintained clear for a width of at least 1.5 m beyond the edge of the carriageway or such lesser width as the Engineer may agree.

The gradient of deviation shall not be greater than 12% except with the express approval of the Engineer, and any acute intersection of a gradient shall be properly graded to a smooth vertical curve, to the satisfaction of the Engineer.

Temporary ditches and culverts of adequate size and strength shall be provided alongside and under the temporary road to the satisfaction of the Engineer.

(c) Construction

Unless otherwise instructed gravel wearing course shall be used for the deviation and shall be minimum 150mm compacted thickness complying with Section 10 of the Standard Specification which is placed on a sound, prepared, trimmed and compacted base. The Contractor shall allow in his rates and prices for removal and replacement of any unsuitable material before placing of gravel wearing course as this will not be paid for separately.

The Contractor shall take all measures necessary to minimise the effects of dust, consistent with Clause 904(a) of the Standard Specification. The Contractor shall ensure sufficient resources are available at all times to mitigate the effects of dust, including, but not limited to, the sprinkling of water at the rate of 1.4 litres per m² at least four (4) times per day or as instructed by the Engineer, with at least one round of sprinkling done before sunset.

(d) Drifts (Fords)

Where a road is deviated to cross a large watercourse which is impracticable to bridge or culvert, a drift shall be constructed of stones or small boulders with the intersections filled with spalls to make a firm bottom. This pitching shall be carried up the banks of the watercourse above the flood level of the stream. The dimension of the drift shall be such that there is less than 0.20 m of water over the road at all times, except in flood. The edge of the drift shall be defined with posts or other markers and a gauge installed to indicate the maximum depth of water over the road. The minimum width of the drift shall be 3.5 m.

The Contractor shall render to the public all possible assistance, particularly in times of flood, and if necessary shall provide a vehicle, labour and tow rope to extract vehicles immobilized in the drift.

(e) Maintenance of Surface

The maintenance shall aim at providing at all times a smooth, dust free surface safe for use by public and private traffic maintained to the satisfaction of the Engineer.

. 906 PASSAGE OF TRAFFIC THROUGH THE WORKS

The Contractor shall ensure passage of traffic through the works as shown in the drawings or as instructed by the Engineer. The Contractor shall be deemed to have inspected the site and satisfied himself as to the adequacy of his bid for these works and no additional payment shall be made for any other cost borne by the contractor for traffic control. Should the contractor propose other methods for passage of traffic, e.g. construction of deviations, use of existing roads etc, the contractor shall investigate the alternatives, construct and maintain them to the satisfaction of the Engineer. No traffic shall be diverted without the express authority of the Engineer. The Employer shall not be liable for investigations or costs arising from alternative methods of traffic control proposed by the Contractor. Deviations or other measures for traffic control where proposed by the contractor shall meet requirements of the Specifications and Drawings and shall be subject to approval by the Engineer.

The Contractor shall ensure that the workforce and site supervisory staff at all times wear high visibility garments when work is carried out on or adjacent to a section of the road open to traffic. In addition, the contractor shall provide a full-time traffic safety officer to coordinate all aspects of road safety for the whole site and ensure the continuous availability of appropriate resources to satisfy the requirements of this Clause.

. 907 SIGNS, BARRIERS AND LIGHTS

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

Notwithstanding any indications to the contrary, the road signs provided shall be fully reflectorised and in conformity with Clause 9.1 of the "Manual for Traffic Signs in Kenya Part II".

. 909 ASSISTANCE TO PUBLIC

Add the following:

The Contractor shall be responsible for safely maintaining and directing traffic through or around any part of the Works included in the Contract, with the maximum practical convenience, for the full twenty four hours of each day.

The Contractor shall render to the public all possible assistance when they are passing over roads maintained by him and over minor, private or temporary roads or bridges when used as deviation or when passing through the Works.

Whenever the Contractor's operations create a condition hazardous to traffic or to the public, he shall furnish, erect and maintain such fences, barricades, lights, signs and other services, as are necessary to prevent accidents or damage or injury to the public.

The Contractor shall also furnish such guards and flagmen as are necessary to give adequate warning to traffic or to the public of any dangerous conditions that might be encountered and shall provide prompt assistance to any vehicle experiencing difficulty in passing over the Works under construction, or through any diversions or roads maintained by the Contractor, if necessary by providing a towing vehicle, labour and tow rope to assist such vehicles.'

Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures, as above provided, the Engineer may direct attention to the existence of a hazard, and the necessary warning and protective measures shall be furnished and installed at the Contractor's expense. Should the Engineer point out the inadequacy of warning and protective measures, such action on the part of the Engineer shall not relieve the Contractor from responsibility for public safety or relieve him of his obligation to furnish and pay for these devices.

910 ACCESS ROADS

Add the following Sub-Clause

910.1 Use of Minor Private Roads as Deviation

Where agreed by the Engineer that the Contractor may use a minor or private road as a deviation, the Contractor shall be entirely responsible for negotiating with and obtaining the prior consent of the Local Authority or owner, respectively. The Contractor shall pay for any additional maintenance costs or shall if necessary, maintain the minor road for the period it is used as a deviation. He shall reinstate the road afterwards to the satisfaction of the Local Authority or owner, and shall compensate the Local Authority or owner for any damage arising out of the use of the road as a deviation.

The standard of such minor or private road when used as a deviation shall at least comply with Clause 904 above for temporary roads and if necessary the Contractor shall, at his own expense improve the road to bring it to this standard before it is used as a deviation, and shall maintain it to that standard while it is used as a deviation. The length of the deviation shall not be excessive and shall be kept as short as practicable.

911 CONTRACTOR'S CONSTRUCTION TRAFFIC

Add the following new Clause 911.1 and 911.2.

911.1 Insurance

The Contractor's attention is particularly drawn to Article 16, "Insurance of the Conditions of Contract, and the Contractor shall indemnify the Employer against and shall insure against all losses and claims for injuries or damage to any person or any property which may occur due to the passing of traffic, whether through the Works, or on specially constructed deviations, or on existing public or private roads used as deviations.

912 MEASUREMENT AND PAYMENT

Insert the following immediately below the heading of this Clause in the Standard Specification: -

The Contractor shall be deemed to have allowed elsewhere in his rates and prices for any differences between the actual cost of carrying out the works and the Lump Sum amounts for the said works priced by the contractor in the Bills of Quantities.

Penalty for failure to comply with requirements of Section 9 of the Specifications

If, in any month, the Engineer is not satisfied that the Contractor has fully complied with any provisions or instructions under Section 9 of the Specifications, the Employer shall withhold the whole of the installment or payment due to the Contractor for the relevant item of work stated in the Bills of Quantities. Failure or refusal by the Contractor to maintain deviations, improve and maintain the existing roads ahead of the works, or failure to take the necessary actions for the safety and convenience of the public traffic within the time instructed or as required by Statutory Authorities shall be sufficient cause for the Employer to apply a deduction of Kshs. **150,000/=** (One Hundred and Fifty Thousand shillings) per day from any monies due to the Contractor, until all provisions and instructions prescribed have been complied with to the satisfaction of the Engineer. Provided further that where notified by the Engineer and the Contractor fails to complete improvement or maintenance of any section of existing road or deviation within 14 days of the Engineer's notice thereof, the Employer shall deduct **KShs 400,000/=** (Four hundred thousand shillings) per day.

Delete paragraph 912 (a) and insert the following:

(a) Item: Improve Existing Road Unit: Lump Sum

Payment shall be by Lump Sum amount allowed in the Bills of Quantities. On satisfactory completion improvement of the whole road, 60% for the Lump Sum amount shall be paid to the contractor and the balance of 40% shall be paid in equal monthly installments throughout the remaining period of the contract excluding defects liability period and subject to any recoveries and deductions due under this Clause. The total sum of installments paid shall not exceed the Lump Sum amount.

(b) Construct and maintain deviations Unit: km

Construct and maintain Deviation shall be measured to the nearest 0.1 km along the centreline of the deviation road and paid for from the relevant item in the Bills of Quantities. The Contractor shall be paid 70% of the billed amount when he completes construction of the deviation road to the satisfaction of the Engineer. The balance shall be paid in equal monthly installments during the remaining period of the contract, excluding the period of defects liability, provided that the contractor has satisfactorily maintained the deviation in accordance with Clauses 904 and 905 of the Specification when the deviation road is in operation.

Payments for this item shall be subject to recoveries and deductions that become due under this Clause as a result of any failure by the contractor to carry out maintenance of the deviation road as required.

If the Contractor fails to construct and / or to maintain diversions at the proper time, or to take the necessary precautions for the safety and convenience of public traffic as required by statutory authorities or as ordered by the Engineer, the Employer may engage other contractors or use the services of others to maintain the diversion. The actual cost of such maintenance shall be deducted from the Contractor's interim payment certificate.

It is the Contractor's responsibility to plan and execute the construction of any diversions deemed necessary during construction work. Prior approval of the diversion routes must be cleared with the landowners concerned and the Engineer before commencing the construction of any diversion.

(d) Item: Maintain the passage of traffic

Unit: Lump Sum

Payment shall be by Lump Sum amount allowed in the Bills of Quantities made in equal monthly installments for satisfactory and continuous maintenance and attendance to passage of traffic throughout the remaining period of the contract, excluding defects liability period and provided that:

- (i) The total sum of installments paid shall not exceed the Lump Sum amount.
- (ii) Payments for this item shall be subject to recoveries and deductions that become due under this Clause as a result of failure by the contractor to maintain passage of traffic as required.

On completion of the Works, the Contractor shall remove all temporary diversions, haul roads, access ramps and signs and barriers, etc. and restore the land to its original condition.

Add the following:

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 11 – SHOULDERS TO PAVEMENT

. 1101 GENERAL

Shoulders will be constructed in accordance with the typical pavement cross-section, shown on the drawings

Add the following:

Footpaths will be constructed in accordance with the typical pavement cross-section, shown on the drawings or as directed by the Engineer.

. 1106 MEASUREMENT AND PAYMENT

Measurement and payment shall be in accordance with the relevant bill items in the Bill of Quantities.

SECTION 12 – NATURAL MATERIAL SUBBASE

. **1201 GENERAL**

The Contractor shall, as directed by the Engineer, bench and compact the subgrade or improved subgrade to 100 % MDD (AASHTO T99), provide, lay and compact material for subbase as directed by the Engineer and in accordance with Sections 5 and 15 of the Standard Specifications.

. **1203 MATERIAL REQUIREMENTS**

Natural materials for subbase shall conform to the specifications given in Section 12 of the Standard Specifications for cement or lime improved subbase.

The thickness of improved subbase to be applied shall be as shown on the Drawings or as instructed by the Engineer.

. **1209 MEASUREMENT AND PAYMENT**

(a) Item: Natural materials for subbase
Unit: m³

Natural material for subbase 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.

The method of measurement shall be "method - A" as in the standard specifications.

No extra payment will be made for haulage of gravel material as the overhaul costs shall be deemed to have been factored in the rates inserted in the Bills of Quantities.

SECTION 13 - GRADED CRUSHED STONE FOR BASE

. 1301 DEFINITIONS

The Graded crushed stone to be used for Base is to be Class A, and the Grade 0/30.

. 1303 MATERIAL REQUIREMENTS

- b) In clarification to the provisions of this Clause, Graded crushed stone material shall comply with the following requirements:

L.A.A	30 max
A.C.V	25 max
S.S.S	12 max
F.I	25 max
CR	100 min

- c) Stone should be free of foreign matter. The fines/passing 0.425mm sieve shall be non-plastic

In clarification to the provisions of this Clause the material shall be 0/30 mm and its grading after compaction shall be a smooth curve within and approximately parallel to the following envelope:

Sieve size mm	Percentage by weight passing
50	-
37.5	100
28	90-100
20	65-95
10	40-70
6.3	30-55
2.0	20-40
1.0	15-32
0.425	10-24
0.075	4-10

. 1304 CRUSHING, SCREENING AND MIXING

In clarification to the provisions of this Clause, Graded Crushed Stone shall be mixed in a mixing plant (pugmill).

. 1306 LAYING AND COMPACTING GRADED CRUSHED STONE BASE

In clarification to the provisions of this Clause, Graded Crushed Stone shall be laid by a mechanical paver for cement or hydraulically bound layers.

SECTION 14 - CEMENT TREATED MATERIALS

. 1401 CEMENT TREATMENT

a) Cement

In variation to this Sub-Clause, cement for stabilization shall be ORDINARY PORTLAND CEMENT (OPC) complying with KS 1725: 2001 CEM I 42.5 N or equivalent, subject to the Engineer's approval.

Moisture content

The moisture content of the treated material shall be as directed by the Engineer but nevertheless within the range of 85% to 105% of the Optimum Moisture Content (AASHTO T180).

b) Mixing and Placing

The material to be stabilized and the cement shall be mixed by an approved stationary mixing plant for material to be used for pavement construction, widening and shoulders and shall be placed by a mechanical paver. Mixing and laying by a mechanical grader shall not be allowed.

. 1403 MATERIAL REQUIREMENTS

a) Cement

In variation to this Sub-Clause, cement for improvement shall be ORDINARY PORTLAND CEMENT (OPC) complying with KS 1725: 2001 CEM I 42.5 N.

Cement treatment will be as outlined in the Standard Specifications for road and bridge construction. The cement content of the treated material shall be as instructed by the Engineer and will normally be about 2-4%.

. 1406A MIX REQUIREMENTS

(ii) Proportions

The ratio of cement to aggregate by weight (including any absorbed moisture but excluding free water in the aggregate) shall be such as to produce average crushing strengths to the requirements of this Section.

The amount of cement to be added shall be confirmed by the Engineer following laboratory trials, and site trials carried out by the Contractor in accordance with Section 2 of the Standard Specification.

The water content of the mixed concrete shall be such as to ensure that the specified degree of compaction can be achieved under all normal working conditions.

(iii) Crushing strength

The essential strength requirement for the material is that the average 28-day strengths of groups of three cubes shall be such that not more than one such average strength in any consecutive five such averages is less than 5.0 N/mm². If, however, the overall average of any consecutive five groups of three cubes (i.e. fifteen cube strengths) falls below 6.0 N/mm² at 28 days, or if the average range of five consecutive groups exceeds 15 N/mm² the Engineer may require the use of different materials, mix proportions, plant or methods notwithstanding any approval which may have been previously given to such materials, mix proportions, plant or methods. The initial rate of testing shall comply with the requirements of Section 17 of the Standard Specification until the Engineer is satisfied that the specified material is being consistently produced.

Further in order to ensure a high probability that at, an early stage the above requirements will be met, the average 7-day strengths of groups of three cubes shall be not less than 4.0 N/mm² and if more than one of the 7-day average strengths of groups of three cubes in any consecutive five such averages fall below 4.5 N/mm² the cement content shall be increased to such a value as may be approved by the Engineer and. the making of cubes shall be continued at the same rate as at the start of the work until the results show that a satisfactory material is being consistently produced.

1406B STATIONARY PLANT METHOD OF CONSTRUCTION

(i) Site trials

The Contractor shall carry out site trials in accordance with Section 2 of the Standard Specification at least one month before he intends commencing full scale construction of any improved natural gravel subbase layer. Should the trial show that the specified strength and compaction requirements cannot be achieved the Contractor shall amend the mix proportions or the laying and compaction techniques in order to achieve the required result.

(ii) Mixing, transporting and laying

The improved natural gravel shall be mixed, transported and laid in accordance with the provisions of Section 14 – Clause 1406 and stationary plant method of construction is to be used.

(iii) Compaction

Immediately after laying, the mix shall be compacted by vibratory and smooth wheel rollers to 96% of the target dry density. Compaction shall be completed within 2 hours of the cement being added to the gravel at the mixing plant.

(iv) Finishing

The surface finish after compaction shall be free from ridges compaction planes, laminations, loose and segregated material and other surface irregularities and shall be to line and level and within the tolerances specified in Section 3 of the Standard Specification. If the surface fails to meet the requirements of this Specification, the Contractor shall take the action Set out in the appropriate part of Section 3 of this Specification or such other action as the Engineer may instruct or agree.

(v) Joints

At the end of each day's work, the improved gravel shall be compacted against a securely fixed vertical temporary stop-end and if compaction is being done with a vibratory roller this shall be used transversely close to the stop-end. In addition, the material in the corners adjacent to the stop-end shall be compacted by means of a small power-operated compactor. When the stop-end is removed any poorly compacted material adjacent to it shall be removed and a 1:1 cement: sand grout shall be applied to the exposed face to a thickness of 5 to 10mm before proceeding with the laying of further adjoining improved gravel. Such fresh improved gravel shall be thoroughly compacted against the joint and where a vibratory roller is employed this shall be used transversely close to the joint again using the small power-operated compactor in the corners of the new work. None of the compacting equipment shall be allowed to bear directly on the hardened or partially hardened improved gravel previously laid. Where the full width of the layer cannot be placed by one pass of the paver, work shall be arranged so that at longitudinal joints a free edge of spread material is not exposed for more than one hour after mixing before placing the adjacent layer. Where a free edge is exposed for more than one hour after mixing it shall be cut back to expose fully compacted material before laying the adjacent layer.

. **1409 PROTECTION AND CURING**

Curing of treated material shall be by method **(i)** or method **(iii)**. Method **(ii)** is prohibited.

. **1410 TRAFFIC**

Traffic or equipment, other than that actually engaged in the various treatment processes, shall not run over the layer being processed or compacted.

No vehicle with an axle loading greater than 2 tonnes shall run on the improved gravel layer within a period of 14 days after placing this layer. Vehicles with rubber tyres with an axle loading less than 2 tonnes, or wheels or tracks of concreting plant, shall not use any part of a newly constructed pavement within 7 days.

. **1412 MEASUREMENT AND PAYMENT**

Stabilizer

The provision of the stabilizer shall be measured by the tonne calculated as the specific weight of stabilizer added to the material.

Mix-in stabilizer

Mixing stabilizer into the material shall be measured by the cubic metre of treated material calculated as the product of the compacted sectional area treated and the Length

SECTION 15 - BITUMINOUS SURFACE TREATMENTS

- **PART A – GENERAL**

- **1504A HEATING OF BITUMINOUS BINDER**

Bitumen 80/100 shall be sprayed in the range of 170°C – 180°C and the maximum heating temperature is 190°C. Bituminous binder shall not be kept within spraying temperature range for periods exceeding 1 hour.

- **1505A ADHESION AGENT**

For all surface dressing, an approved adhesion agent shall be added to the binder, unless otherwise instructed by the Engineer. Adhesion agent shall be added to, and well mixed with, the binder immediately before each spray run.

- **1506A CONSTRUCTION LIMITATIONS**

No bituminous spray shall be applied to a surface with a road temperature of less than 25°C for surface dressing, and 15°C for prime coat, or with adverse weather conditions threatening. A minimum period of 6 weeks shall elapse between the placement of asphalt and the application thereon of bituminous surface dressing.

PART B - PRIME COAT AND TACK COAT

. 1502B MATERIALS FOR PRIME COAT AND TACK COAT

- i). The binder for prime coat shall be MC 70 as the base of GCS and shall be applied over the full width of the surface of the course to receive the first layer of bituminous material.

Blinding material shall be crusher dust, or a clean fine aggregate or coarse sand free from lumps of clay or other deleterious matter.

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 dilutants.

The rate of spray of the prime coat shall generally be within the range of 1 – 1.2 l/m²

- ii). The binder for the tack coat shall be K1-60. A tack coat shall be applied over the full width of the surface of each bituminous material to receive a further bituminous layer.

The rates of spray of the tack coat shall generally be within the range of 0.2 – 0.8 l/ m²

A tack coat shall also be applied to any prime coat, which has lost its adhesive properties due to contamination or long exposure or weathering before receiving the bituminous layer. Such an application shall be made without additional expense to the Employer unless it is required due to reasons outside the Contractor's control.

. 1503B 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: -

- 1) Where instructed, the Contractor shall prepare areas for the repair of potholes, road edges and other 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 all as directed by the Engineer. Measurement and payment shall be made under the relevant item of Bill No. 15.
- 2) 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.

. 1504B SPRAYING OF PRIME COAT AND TACK COAT

Application rates of the bituminous prime coat shall be designed by the Contractor to take into account surface condition of the surface to be primed, expected traffic conditions, blinding, and the time duration before the subsequent bituminous treatment is applied.

The rate of spray of bituminous prime coat refers to the gross volume of the cut-back bitumen, that is to say the volume of the bitumen plus dilutant.

- iii) The rate of application of prime coat shall be 1 to 1.2 litres/m². The exact quantity to be applied may be varied within these limits to suit field conditions and will be determined from trials by the Engineer.

- iv) The rate of application of the tack coat on bituminous surfaces shall be 0.2 to 0.8 litres/m². The exact quantity to be applied may be varied within these limits to suit field conditions and will be determined from trials by the Contractor and approved by the Engineer.

. **1506B TOLERANCES**

Tolerance shall be +5% of the rate ordered. Work records are to be kept on a daily basis, with details recorded and calculated at the end of each distributor run. The Contractor shall prepare and use a suitable record sheet, which records details of weather and road temperature conditions, length and width of each run, binder dipping before and after each run of the distributor, calculation of actual application rate, under or overspray, and spray outside tolerance. Actual application rates shall be calculated immediately after each run, so that the operation of the distributor can be adjusted to ensure subsequent application rates are within tolerance.

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 Surfacing

. **PART A – GENERAL**

. **1601A SCOPE**

Part A comprises all the general requirements for bituminous mixes which apply to Part B and C as well. Quality control, workmanship and equipment shall be to current international best practice.

. **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 this 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 works.

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 shall be the batch-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 50C and a fixed thermometer easily read from outside the tank. Any bitumen that has been heated above 1800C 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.

The self propelled spreader finisher shall be fitted with electronic level control devices, and level control shall be from tensioned wire supported at every 5m intervals or levelling beam, as tried on site and subsequently approved by the Engineer.

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 the Standard 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 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:

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

The Contractor shall design a job-mix formula and carry out all appropriate laboratory tests and site trials to produce a working mix, which conforms in all respects to the requirements of this Specification,

and is approved for use by the Engineer two months prior to commencing work using a bituminous mix.

The mixes are to be designed in accordance with ORN19: A guide to the design of hot mix asphalt in tropical and sub-tropical countries.

A volumetric design shall be carried out using the Marshall Method as described in Appendix C of ORN19. The mixes must also satisfy the refusal density requirements. This test is to be carried out in accordance with Appendix G of ORN19. The voids in mix (VIM) must be >3% at refusal density at the optimum bitumen content from the Marshall design and also at the optimum plus and optimum minus the margin of tolerance permitted during mixing (bitumen content as percent of total mix + 0.3%).

Natural sand shall not be used in bituminous mixes.

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.

Replace the second paragraph with the following:

The trials shall be carried out to:

- i) Test materials, designed in the laboratory, so that a workable mix which satisfies the specification requirements can be selected.
- ii) 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°C for 60/70 bitumen.

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

- i). 125-1650C when 80/100 bitumen is used
- ii). 130-1700C when 60/70 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 obtaining 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.

Add the following:

The mix shall be transported from the mixing plant to the paver in trucks having clean, smooth beds, which have been treated to prevent adhesion of the mixture to the truck bodies. Gasoline, kerosene, diesel fuel or other solvents shall not be used for this purpose. Loads shall be covered by waterproof canvas or metal sheets during wet weather. Vehicles shall be insulated when the air temperature and/or length of haul make this necessary to maintain the temperature within the specified limits. Hauling over freshly laid material will not be permitted.

1609A LAYING THE MIXTURE

Mix shall be in the temperature range 135°C – 165°C when tipped into the hopper of the spreader. Mixtures that have a temperature of less than 135°C when dumped into the spreader will be rejected.

The spreader shall be adjusted and the speed regulated so that the surface of the course will be smooth and the course of such depth that, when compacted, it will conform to the cross-section shown on the Drawings. Lanes shall be parallel to the road centreline.

Where possible laying plant capable of spreading the mixture over the required full paved width shall be used, which may require the use of at least two mechanical pavers working in echelon.

All joints shall present the same texture, density and smoothness as other areas of the surfacing. The joints between old and new lanes or sections shall be carefully formed in such manner as to ensure a continuous bond between the old and new pavement. All contact surfaces at cold joints, joints with manholes, pits, etc. shall be coated with a thin, uniform coat of MC70 or other medium curing bitumen.

1610A COMPACTION

The Contractor shall establish the best combination of rollers, number of passes, any limitations which must be applied to rolling temperatures, the optimum settings for the frequency and amplitude of vibration for the vibratory roller including the temperature range over which it can effectively be used for compaction during preconstruction trials.

The mix shall not be less than 120°C when rolling is commenced.

Replace the 4th paragraph by the following:

Initial rolling with a pneumatic tyred roller shall follow the laying plant as closely as possible. The rollers shall be operated at a slow and uniform speed (not exceeding 5km/h).

Add the following at the end:

Tests for conformity with the smoothness and levels specified shall be made by the Contractor immediately after initial compaction and any deviations in excess of the specified tolerances shall be corrected by loosening the hot surface with rakes and removing or adding material as necessary before continuing the rolling. The speed of the rollers shall not exceed 5 km/h and shall at all times be slow enough to avoid displacement of the hot mixture. Any displacement of the mixture occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once by loosening the surface with rakes and re-rolling. Rolling of the surfacing shall be continued until all roller marks are eliminated and the required density is obtained.

The rollers shall not be permitted to stand on surfacing which has not been fully compacted. Precautions shall be taken to prevent the dropping of oil, grease, gasoline, or other foreign matter on any layer. The Contractor shall provide competent workmen who are capable of performing all work incidental to the correction of all surfacing irregularities.

After final rolling, no vehicular traffic of any kind shall be permitted for at least 12 hours.

1611A FINISHING, JOINTS AND EDGES

Amend the second paragraph as follows:

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 60/70 penetration grade bitumen just before the additional mixture is placed against it.

Amend the fourth paragraph as follows:

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 60/70 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.

Longitudinal construction joints in the various bituminous layers shall be staggered by at least 150mm. Longitudinal joints in previous layers which have been rolled over shall be cut back and tack coated to ensure a continuous bond between new and old mix at the correct level, with no tapering of the new mix.

Add the following:

The Contractor shall produce a plan showing the position of all pavement construction joints for approval by the Engineer before pavement construction commences.

Construction joints in the various pavement layers shall be staggered by at least the following distances:

Transverse joints in binder course shall be staggered by at least 500mm. The roller shall pass over the unprotected end of the freshly laid mixture only when laying of the surfacing is to be discontinued for such length of time as to permit the mixture to become cold. Otherwise 500mm at the end of the lane shall be left un-compacted.

Cold transverse joints shall be cut back to expose an even, vertical surface for the full compacted thickness of the course and painted with medium curing cutback bitumen as specified above. The fresh mixture shall be raked uniformly against the joint, and carefully compacted to ensure a good bond with the cold material.

The Contractor shall adjust any kerbs, gulley pots and chambers in accordance with final finished road level before laying the final Asphalt Concrete binder material 0/14 and 0/20 surfacing layer.

PART B - ASPHALT CONCRETE FOR SURFACING

1601B INTRODUCTION

Some modifications, to the Standard Specification, which takes into account aspects of the Super pave Mix Design methods, have been made. This shall be in accordance with the procedures presented in Overseas Road Note 19, "A guide to the design of hot mix asphalt in tropical and subtropical countries" and detailed in the current manuals produced by the Asphalt Institute. The contractor shall be deemed to possess a copy of these publications and shall provide at least two copies of each on site, one for the Engineer and the other for the Contractor.

1602B MATERIALS FOR SUPERPAVE PERFORMANCE GRADE- BITUMEN ASPHALT CONCRETE

(a) Penetration grade bitumen

Modify sub-section (a) as follows:

The bitumen shall be penetration grade 60/70 and shall meet the requirements of Table 4.3 in ORN 19.

Minimum requirements for Penetration grade bitumen (ORN19 Table 4.3)

Property	Test Method	Unit	Pen 60/70
Based on original bitumen penetration at 25°C	EN1426	0.1mm	60-70
Softening point (°C)	EN 1427		49-56
Resistance to hardening after heating for 5 hr at 163°C	EN 12607-1		
a) Retained penetration		%	≥ 54
b) Increase in softening point, Severity 1		°C	≤ 8
c) Change of mass a(absolute value)		%	≤ 0.5
Flash point	EN ISO 2592	°C	≥ 232
Solubility	EN 12592	%	≥ 99.0
Kinematic viscosity at 135°C	EN 12595	mm ² /s	≥ 300
^a Change in mass can be either positive or negative.			

(b) Aggregate

- In the standard specification rename Table 16B-1 as 16B-1(a)
- Add the following:

The coarse aggregate shall be entirely crushed rock, from a source known to give high values of stability (> 9kN) in the Marshall test. Aggregate shall be Class 'a' meeting the requirements given in Table 16B-1b below.

Table 16B-1b: Requirements for coarse aggregate

Property	Test	Property
Cleanliness	Sand equivalent for 4.75mm fraction ¹	> 40
	Plasticity index for materials passing 0.425mm sieve ²	<4
	Linear shrinkage for materials passing 0.425mm sieve, %	<2
Particle shape	Flakiness Index (FI) ³	<25
Strength	Aggregate Crushing Value, (ACV) ⁴	< 25
	Aggregate Impact Value, (AIV) ⁴	<25
	10% FACT (dry) kN ⁴	> 160
	Los Angeles Abrasion, (LAA) ⁵	<30
Abrasion	Aggregate Abrasion Value ⁴	< 14
Soundness ⁷ 5cycles % loss	Sodium Sulphate Soundness (SSS) Coarse aggregate	<10
	Sodium Sulphate Soundness (SSS) Fine aggregate	<16
	Magnesium Sulphate Soundness (MSS) Coarse aggregate	<15
	Magnesium Sulphate Soundness (MSS) Fine aggregate	<20
Polishing	Polished Stone Value	>57
Water absorption	Water absorption, % ⁶	<2
Bitumen affinity	Immersion Mechanical Test: Index of retained Marshall stability, % ⁸	>75
	Static Immersion Test, % coating retained ⁹	>95
	Retained Indirect Tensile Strength % at 7% VIM ¹⁰	>79

- i). AASHTO T176
- ii). British Standard 1377: Part 2
- iii). British Standard 812: Part 105
- iv). British Standard 812: Part 110 to 114
- v). ASTM C131 and C 535
- vi). British Standard 812: Part 2
- vii). AASHTO T104
- viii). D Whitecoak (1990)
- ix). AASHTO T 182
- x). AASHTO T 283
- xi). BS EN 12591: 2009

Unless otherwise instructed by the Engineer aggregates should satisfy the following Superpave Performance Grade Bitumen aggregate consensus properties which requirements are presented in Table 16B-1(c):

- Coarse Aggregate Angularity (CAA) – ASTM D 5821
- Fine Aggregate Angularity (FAA) – AASHTO T 304
- Flat and elongated particles – ASTM D 4791
- Sand equivalent – AASHTO T 176

Table 16B-1(c) Superpave aggregate consensus property requirements:

Cumulative Equivalent Standard Axles (CESA) ¹ in Million	Fractured faces, Coarse Aggregate, Percent Minimum		Uncompacted Void Content of Fine Aggregate, Percent Minimum		Sand Equivalent, Percent Minimum	Flat and Elongated, Percent Maximum
	Depth from surface		Depth from surface			
	≤100mm	>100mm	≤100mm	>100mm		
3 to <10	85/80 ²	60/-	45	40	45	10

¹The anticipated project traffic level expected over a 20 year design period

²85/80 denotes that 85 percent of the coarse aggregate has one fractured face and 80 percent has two or more fractured faces

³Criterion based upon a 5:1 maximum to minimum ratio

1603B GRADING REQUIREMENTS

The grading mixture of coarse and fine aggregate shall meet the requirements given in Table 16B-1(d) and Table 16B-1(e) for a 19mm nominal maximum size aggregate.

Table 16B-1(d) Superpave Aggregate Grading Control Point

Nominal Maximum Size (mm) (Note 1 below)	Sieve size (mm)	Control point (%passing)	
		Minimum	Maximum
19.0	25	100	-
	19	90	100
	12.5	-	90
	2.36	23	49
	0.075	2	8

Note (1) - The definition of Nominal Maximum Size of aggregate is one sieve larger than the first sieve to retain more than ten per cent of the aggregate. It is also recommended that where possible the largest particle size should not be more than 25 mm so that the requirements of the Marshall test can be complied with.

Table 16B-1(e) Superpave Penetration Grade Bitumen boundaries of aggregate restricted zone (Note 2 below)

Sieve size within restricted zone (mm)	Percent passing sieve size Nominal maximum size ; 19.0mm (Note 1 below)	
	Minimum	Maximum
9.5	39.1	39.1
2.36	21.2	28.3
1.18	15.5	23
0.3	9.6	15.5

Note (1) - The definition of Nominal Maximum Size of aggregate is one sieve larger than the first sieve to retain more than ten per cent of the aggregate. It is also recommended that where possible the largest particle size should not be more than 25 mm so that the requirements of the Marshall test can be complied with.

Note (2) - If gradations that violate the restricted zone perform similarly to or better than the mixes having gradations passing outside the restricted zone; then, the restricted zone requirement is redundant for mixes meeting all Marshall and/or Superpave Penetration Grade Bitumen volumetric parameters specified in section 1604B of this specification.

1604B REQUIREMENTS FOR ASPHALT CONCRETE

The mix design should be carried out using the Marshall and/or the Superpave Performance Grade Bitumen test procedures. The Engineer should instruct in writing if either or both of these methods should be applied.

The mix design specifications for the two methods are as follows:

Marshall Method

The mixture shall comply with the requirements given in Table 16B-2(a).

TABLE 16B-2(a) Requirements for Asphalt Concrete

Asphalt concrete	No. of blows Marshall compaction	Minimum Stability (kN)	Flow (mm)	Air voids (VIM) (%)	Voids in Mineral Aggregate (VMA) (%)
19	75 ¹	9	2 – 4	3 – 6	Minimum 13

Note 1: Satisfactory volumetric composition must be confirmed by refusal density testing

The nominal binder content shall be 5%. In addition to the requirements given in Table 16B-2, the maximum Marshall Stability for 2x75 blows shall be 18 kN, and at compaction to refusal shall retain a minimum of 3% VIM.

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 and should meet the requirements presented in Table 16B-1(b) and Table 16B-1(c). A grading conforming to requirements detailed in Table 16B-1(d) and Table 16B-1(e) of this Specification shall be used.

Having established the suitability of the aggregate source, several gradings satisfying the requirements of Table 16B-1(d) and Table 16B-1(e) 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 vibratory hammer in accordance with BS 598 (Part 104:1989) with the following revision:

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

From the bitumen content-VIM relationship a bitumen content which corresponds to a VIM of 3% shall be identified. Compaction trials shall be undertaken, to confirm the workability of the mix. At least two or more gradings will be required for compaction trials. The compaction trials will identify a workable mix which can be made to a bitumen content which gives 3% Voids in Mix (VIM) at refusal density.

i). Superpave Method

The mix design, when compacted in accordance with AASHTO T 312 (Preparing and determining the density of Hot Mix Asphalt (HMA) specimens by means of the Superpave gyratory compactor) shall meet the relative density, voids in the mineral aggregate (VMA), Voids filled with Asphalt (VFA) and dust to binder ratio requirements specified in Table 16-B2(b).

The initial, design and maximum number of gyrations are specified in AASHTO R 35, Superpave volumetric design for Hot Mix Asphalt (HMA).

TABLE 16B-2(b) Requirements for Mix Design

Cumulative Equivalent Standard Axles (CESA) ¹ in Million	Required Relative Density, Percent of theoretical maximum specific gravity			Voids in the Mineral Aggregate (VMA), Percent Minimum		Voids Filled with Asphalt (VFA) Range, Percent	Dust-to- Binder Ratio Range
	N initial	N design	N max	Nominal maximum size Aggregate (mm)			
				19.0	12.5		
3 to <10	≥89.0	96.0	≤98.0	13.0	14.0	65-75	0.6-1.2

¹The *anticipated* project traffic level expected over a 20 year design period

1605B MIXING AND LAYING ASPHALT CONCRETE

Add the following:

The temperature of the bitumen and aggregates when mixed should be determined using both Penetration Index (PI) and softening point of the bitumen on the bitumen tests data chart (BTDC). The temperature of the bitumen and aggregates when mixed shall be 110+/-3°C above the softening point (Ring and Ball) of the bitumen.

Compaction shall 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 mixing and placing of asphalt concrete must be carried out only under favorable weather conditions. Mixing and placing of asphalt concrete will not be allowed if the moisture content of aggregate affects the uniformity of temperature, or if free water is present on the working surface. Mixing shall not be allowed to take place more than two hours before placing begins unless provision had been made for storing. Storage of mixed materials will only be permitted in insulated hot mix bins. In any case, storage will not be permitted for a period longer than 12 hours after mixing, unless otherwise approved by the Engineer.

The minimum thickness of the compacted layer shall be 35mm when 12.5mm nominal maximum size aggregate is used (on the road shoulders).

1606B COMPACTION

Rolling shall be continued until compaction of the completed layer attains a minimum mean value of 95% of refusal density (no value less than 93%) and until the voids measured in the compacted layer are within the specified range as appropriate.

SECTION 17 - CONCRETE WORKS

1703 MATERIALS FOR CONCRETE

(b) Replace the first 3 lines with the following; -

Cement shall comply with the following Kenyan Standards:

- KS1725: 2001 CEM 1 42.5 N for ordinary Portland cement

This work shall consist of placing selected approved material of 250mm minimum depth on the foundation placed 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 boulders 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.

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

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 twenty eight (28) days : 15N/mm²
- Maximum size of coarse aggregate : 20mm
- Maximum cement content : 300 kg/m³.
- Maximum water/cement ration of 50% with slump of 80mm.

b) Construction Method

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

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.

1703B CONCRETE WORKS (CLASS 25/20) OF FOR PIPE CULVERTS

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 pipe culvert headwalls, wingwalls, toe beams and apron slabs. The surface finish shall be F3 or UF3. The requirements of concrete class 25/20 are provided as follows unless otherwise the Engineer will designate any alteration.

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 done 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

(V) Fine and coarse aggregates must be clean, hard, strong and durable, not susceptible to ASR 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:

- **Grading of Fine Aggregates**

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

- **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
% by weight	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, AASHTOT96 : Max. 40% 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, vegetation 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.

c) Concrete Class 25/20

The requirements of Concrete Class 25/20 are provided as follows unless otherwise the Engineer will designate any alteration.

Design compressive strength twenty eight (28) days : 25N/mm²

- Minimum cement content : 300kg/m³
- Maximum cement content : 540kg/m³
- Maximum size of coarse aggregates : 20mm
- Maximum water/cement ratio of 50% with slump of 80mm

d) Proportioning Concrete

The Contractor shall consult with the Engineer as to mix proportions at least sixty (60) 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.

i). Concrete Works

1. 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.

2. Mixing and delivery

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

3. Concrete in hot weather

No concrete shall be placed when the ambient air temperature is expected to exceed 33°C during placement operations.

4. 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.

5. 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.

ii). Measurement and Payment

Measurements for the Concrete Works Class 25/20 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 25/20) of culvert walls and slabs shall be the full compensation for furnishing all materials of the concrete mixing, delivering, placing, finishing horizontal surfaces to class UF2 finish, 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.

1703D CONCRETE WORKS (CLASS 30/20) FOR BOX CULVERTS AND BRIDGE STRUCTURES

Description

This work shall consist of furnishing, mixing, delivering and placing of the concrete for the construction of the insitu beams and deck slab, in accordance with Standard Specifications and in conformity with the requirements shown on the Drawings.

Concrete Class 30/20 shall be used for in situ reinforced concrete box culverts and bridge structures. The requirements of Concrete Class 30/20 are provided as follows unless otherwise the Engineer will designate any alteration;

i).Concrete Materials

a) Cement

Cement shall be of Portland type and shall conform to the requirements of BS or equivalent.

The Contractor shall select only one type or brand of cement or others. Changing of type or of cement will not be permitted without a new mix design approved by the Engineer. All cement is subject to the Engineers 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 Contractors silo or store house shall not exceed more than two (2) months, and age of cement after submit to the Engineer for his approval the result of quality certificate done 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, not susceptible to ASR and free from absorbed chemicals, clay coating, or materials in amounts that could affect hydration, bonding, strength and durability of concrete. The aggregates should conform to BS 882.

Grading of aggregates shall conform to BS 812.

Other requirements for aggregates are as follows:

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

Coarse Aggregate

Abrasion, AASHTO T96	: Max. 40% loss
Soft Fragment and shale, AASHTO M80	: Max. 5% by weight
Thin and elongated pieces, AASHTO M80	: Max. 15%

c) 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, vegetation and salt as determined by the Engineer.

d) 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 30/20

Concrete Class 30/20 shall be used for in situ beams and deck slab. The requirements of Concrete Class 30/20 are provided as follows unless otherwise the Engineer will designate any alteration:

Design compressive strength twenty eight (28) days	: 30N/mm ²
Maximum size of coarse aggregates	: 20mm
Minimum cement content	: 340kg/m ³
Maximum cement content	: 540kg/m ³
Maximum water/cement ratio of 45% with slump of 80mm	

Proportioning Concrete

The Contractor shall consult with the Engineer as to mix proportions at least sixty (60) 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.

ii).Concreting Work

a) Batching

Batching shall be done by weight with accuracy of;

Cement	: 1/2 percent
Aggregate	: 1/2 percent
Water and Admixture	: 1 percent

Equipment should be capable of measuring quantities within these tolerances for the smallest 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.

b) Mixing and Delivery

Slump of mixed concrete shall be checked and approved against designated slump in these specifications. The time elapsing from when the water is added to the mix until the concrete is deposited in place at the site of the work shall not exceed thirty (30) minutes in case that the concrete is hauled in non agitative type trucks or carries, nor more than sixty (60) minutes in case that it is hauled in truck mixers or other carriers with agitators.

c) Concrete in Hot Weather

No concrete shall be placed when the ambient air temperature is expected to exceed 33°C during placement operations.

d) 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, and such night work is subject to approval by the Engineer.

e) 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 30/20 of beams and deck slab 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 30/20) of beams and deck slab shall be the full compensation for furnishing all materials of the concrete mixing, delivering, placing, finishing horizontal surfaces to class UF2 finish, and curing the concrete, equipment and tools, labour and other incidentals necessary for the completion of the work in accordance with the Drawings and these Specifications and as directed by the Engineer.

1722 FORMWORK FOR BOX CULVERTS AND BRIDGES

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 structure.

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

Unless otherwise directed by the engineer, all formwork shall be type F3. Formworks shall be designed to carry the maximum loads which 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.

Unless otherwise described in the Contract, all form joints for exposed surfaces of concrete shall form a regular pattern with horizontal and vertical lines continuous throughout each structure and all construction joints shall coincide with these horizontal and vertical lines.

Form joints shall be sealed against leakage of mortar. PVC pipes of 50mm diameter for weep holes shall be arranged as shown on the Drawings.

Unless otherwise specified, formwork shall be designed to form chamfers at all external corners whether or not such chamfers are shown on the Drawings to prevent cracks and other damage from arising.

The inside surface of forms shall be cleaned and coated with a releasing agent to prevent adhesion of the concrete. Release agents shall be applied strictly in accordance with the manufacturer's detailed instructions. The release agent shall be applied to the formwork prior to erection. Release agent must not come into contact with reinforcement. Immediately before concrete is placed, the forms shall thoroughly be thoroughly cleaned and freed from sawdust, shavings, dust, mud or other debris by hosing with water. Temporary openings shall be provided in the forms to drain away the water and rubbish.

ii) Scaffolding

All scaffolding required to support the forms shall be designed and constructed to provide necessary rigidity and support the loads without appreciable deflection or deformation.

Details, plans and structural and flexural calculations for scaffolding shall be submitted to the Engineer for approval, but in no case shall the Contractor be relieved of his responsibility for the results obtained by use of these plans, etc.

iii) Removal of formwork

The time at which the formwork is struck shall be the Contractor's responsibility and the forms shall not be removed until the concrete strength has reached 20N/mm².

c) Measurement and Payment

Formwork shall be measured as the net area, in square metres, in contact with the finished concrete surface of the walls and slabs. No measurement shall be allowed for formwork of temporary construction joints.

Payment for the Formworks shall be full compensation for furnishing, erecting, jointing all the forms for the concrete including furnishing and applying release agent, and construction of the required scaffolding to support the forms, all conforming to the shape, lines, grade and dimensions of the structure as shown on the Drawings, all in accordance with the Drawings and as directed by the Engineer.

1728 REINFORCING BARS FOR BOX CULVERTS AND BRIDGES

This work shall consist of furnishing, fabricating and placing in the concrete of the drainage and highway structures, reinforcing bars of the quality, type and size in accordance with these Specifications and in conformity with the requirements shown on the Drawings.

a) Material:

Reinforcing bars shall be deformed and shall meet the requirements of British standard BS 4449, unless otherwise shown on the drawings or approved by the Engineer.

No reinforcing bar shall be delivered without a certificate guaranteeing the yield stress. The reinforcing bars shall be kept off the ground, free from dirt, oil, grease, or avoidable rust and stored within a building or provided with suitable covers.

If it is necessary for the Engineer to ascertain the quality of the reinforcing bars, the Contractor shall test the reinforcing bars, at his own expense, by means as directed by the Engineer.

1729 STORAGE OF REINFORCEMENT

Reinforcement shall be kept off the ground, free from dirt, oil, grease and rust and stored within a building or provided with suitable covers.

1730 BENDING REINFORCEMENT

The Contractor shall prepare bar bending schedules for the approval of the Engineer showing the location types, sizes, bending dimensions and cut lengths of the reinforcing bar required to be fixed in the works.

Qualified men shall be employed for the cutting and bending, and proper application shall be provided for such work.

Bars shall be cut and bent cold to the dimensions indicated and with equipment and methods approved by the Engineer.

Stirrups and tie bars shall be bent around a pin having a diameter not less than 15 times the minimum diameter of the bar. Bends of other bars, where full tension in the bar may occur, shall be made around a pin having a diameter not less than 7.5 times the bar diameter as shown on the Drawings.

Reinforcing bars shall be accurately formed to the shapes and dimensions indicated on the Drawings, and shall be fabricated in a manner that will not injure the materials.

1731 FIXING REINFORCEMENT

Reinforcing bars shall be accurately placed in proper position, and so that they be firmly held during placing of concrete. Bars shall be tied at all intersections by using annealed iron wire 0.9mm or larger diameter, or suitable clips.

Distances from the forms shall be maintained, corrected by means of metal hangers, metal blocks, metal supports or other supports approved by the Engineer.

The Engineer shall inspect reinforcing bars after placing. When a long time has elapsed after placing reinforcing bars, they shall be cleaned and inspected again by the Engineer before placing concrete.

When it is necessary to splice reinforcing bars at points, position and methods of splicing shall be determined based on strength calculations and approved by the Engineer.

In lapped splices, the bars shall be lapped by the required length, and wired together at several points by using annealed iron wire larger than 0.9mm. The minimum splice length shall be 40 times diameter of the bar unless otherwise shown on the drawings or instructed by the Engineer.

Exposed reinforcing bars intended for bonding with future extensions shall be effectively protected from injury and corrosion.

Oxyacetylene welding joint of reinforcing steel shall be done only if authorized by the Engineer in writing.

a) Measurement and Payment

Bending and installation of reinforcing bar shall be measured in terms of tons. The length of steel bar of each size will be shown on the drawings in which the bar length for splicing is excluded. In computing the weight to be measured, the theoretical weights of bars of the cross-section shown on the Drawings or authorized shall be used.

These weights are given in the following table: -

Bar type and the Cross-section in millimetres	Weight of Bar in Kilogramme—per 12m length of bar
T10	7.40
T12	10.66
T16	18.95
T20	29.60
T25	46.30
T32	75.80

All testing for compliance will be at the Contractor's expense

SECTION 19 - STRUCTURAL STEELWORK

. **1902 APPLICABLE STANDARDS**

Before the 1st paragraph, add,

‘Unless otherwise specified in the Contract, structural steelwork shall comply with the relevant provisions of BS EN series codes or Eurocode equivalent of the out of date or superseded British Standards listed in this clause, and elsewhere in this section and drawings.’

. **1905 FABRICATION**

In paragraph 2, after the 1st sentence, add,

‘Shop drawings shall contain all material specifications including all physical, mechanical and chemical properties of the same relevant to the works.’

. **1906 PREPARATION OF EDGES AND ENDS OF PLATES AND HOLLOW SECTIONS**

At the end, add this paragraph,

‘For steel hollow sections – no section will be left open ended. All open ends will be welded closed using steel plate of equivalent specification and same thickness as the hollow section in question.’

. **1907 WELDING**

In paragraph 1, after the 1st sentence, add,

‘All welding operations shall be undertaken in the factory under controlled environment, and welds will be applied by skilled welders using specialist equipment to achieve highest possible standards as specified in relevant codes of practice.

No welding of structural connections shall be permitted on site, unless specific exception for specific part/spot on a structural component is requested and approved by the Engineer – even then specialist equipment and personnel will have to be proven.

Replace paragraph 2 with,

‘All welding operations shall comply with the requirements of BS-EN ISO 3834 Part 2 and /or other standards codes specified in the drawings.’

. **1907 TRANSPORTATION AND HANDLING AND ERECTION**

Replace paragraph 3,

‘Upon completion of welding and fabrication works, the steelworks shall be temporarily erected at the Factory, and shall be subject to Engineer’s physical inspection before being dispatched to Site. The Engineer will use this opportunity to inspect specialist equipment employed, and as a due diligence mission for production processes applied.’

. **1908 CORROSION PROTECTION AND SURFACE TREATMENT**

All corrosion protection works to be applied – galvanizing or alkali-zinc paints and epoxy aluminium paints, shall be executed in strict adherence to the specifications and relevant codes EN 12944-6, EN 1461, EN 1090-2, etc, as detailed in the drawings.

No separate payment shall be made for complying with this requirement and the rate is deemed to have been included in the rate for structural steel.

SECTION 20 - ROAD FURNITURE

. **2001 ROAD RESERVE BOUNDARY POSTS**

Road reserve boundary posts shall be provided, with reference points, in compliance with Standard Specification Clause 2001. They shall be placed at 250m intervals along the boundary of the road reserve.

. **2002 FENCING AND GATES**

Add the following:

"Construction material for gates shall be steel. Fencing shall be constituted of wood permanent posts and six strand wire."

. **2003 EDGE MARKER POSTS**

Edge marker posts 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.

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 delivered as directed.

. **2005 ROAD MARKING**

Road marking paints shall be internally reflectorised hot applied thermoplastic materials as specified in clause 219 of the Standard Specifications.

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 is of optical menthyl methacrylic.

CONSTRUCTION

The Road Stud 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 98.5mm². 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:

- a) **Colour**
Shall be white, yellow or red as specified and the Retro – reflectance values should conform to the testing procedures of ASTM E 809.
- b) **Impact Resistance**
The marker shall not crack or break when tested using a 1000gram weight from a height of 1 metre. (ASTM D 2444) or BS 3900 Part E3.
- c) **Resistance to Water Penetration**
There shall be no water penetration behind the lens after submerged in a water bath at 70 + 50oF for 10 minutes. And it should still meet the reflectance Requirement as stipulated by BS 998.
- d) **Heat Resistance**
Shall comply with the initial brightness as per BS 873 Part IV of 1978
- e) **Night Visibility**
The marker shall be bright as per BS 873 Part IV of 1978
- f) **Compression Resistance**
There shall be no cracking sound at a pressure lower than 25 tones as per BS 873 Part IV of 1978.
- g) **Corrosion Resistance**
After immersing a sample of Road stud in a solution containing 30g/1 of sodium chloride for thirty (30) days, there shall not be any signs of corrosion,(BS 998).

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

- i) 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.
- ii) Pot life: not less than 20 minutes at 20°C
- iii) Rotational cure time: between 20 and 30 minutes at 20°C
- iv) 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 striate 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 10mm 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

All materials for guardrails shall comply with the requirements of AASHTO M180-98. Guardrail posts and spacer blocks shall be galvanised UNP steel profiles 120 x 55x7mm or of the type and size shown on the drawings, with posts driven vertically at least 1.2m into the shoulder as directed by the Engineer.

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

Reflective plates shall be galvanised V-type shape, manufactured from 1.5mm thick mild steel plate, with the outer surfaces coated with engineering grade retro-reflective material. Holes for fixing shall be drilled before the plates are galvanised.

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 2.0m.

2008 KILOMETER MARKER POSTS

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

. **2009 RUMBLE STRIPS**

The Contractor shall provide, place, trim, shape and compact to line and level asphaltic concrete rumble strips on the finished shoulders as directed by the Engineer.

Asphaltic concrete rumble strip sets to the full width of the carriageway and shoulders shall also be placed as warning strips to speed humps at the preselected locations marked on the Drawings to the satisfaction of the Engineer.

. **2010 TREES**

Trees will be planted according to the advice given by the District Forest Officer or if not available, from an alternative source approved by the Engineer. The rate shall allow for transportation to site, planting as directed by the Engineer, watering during the first dry season after the planting, and protection until the end of the Maintenance Period.

. **2012 SERVICE DUCTS**

Service ducts shall be provided in locations as directed by the Engineer. Ducts shall be heavy duty PVC spigot and socket pipe of 3mm minimum wall thickness. Minimum cover to the top of the pipe from formation level shall be 0.6m. Pipes shall be bedded and surrounded by a 100mm minimum thickness of compacted fine granular material of 10mm maximum size. The remainder of the trench shall be backfilled with selected backfill material of subbase quality up to the top of formation level.

Measurement and payment shall be by the metre of pipe installed, and shall include all excavation, spoil, bedding and surround, backfill, transport, supply, bed, lay of PVC pipe complete with 2mm galvanised draw wire, and end sealing caps and end markers.

. **2013 ROAD HUMPS**

Where shown on the drawings or directed by the Engineer, the Contractor shall provide, place, trim, shape and compact to line and level road humps.

Road humps shall be constructed in asphaltic concrete or concrete class 20/10 to the dimensions shown on the drawings or as directed by the Engineer.

Road humps should be painted with white thermoplastic paint of 45° diagonal strips as shown on the drawings.

. **2014 RAISED ZEBRA CROSSING**

Where shown on the drawings or as directed by the Engineer, the Contractor shall provide, place, trim, shape and compact to line and level flat-topped zebra crossing as detailed on the drawings.

. **2015 DUCT MARKER POSTS**

Duct markers shall be installed by the Contractor at each end of the services ducts provided under clause 2015. The duct marker shall be located immediately beyond the outer edge of the shoulder or footpath and as close to the line of the duct as physical constraints permit. Where several ducts are laid side by side, only one duct marker post will be necessary. The duct marker posts shall be constructed as shown on the Drawings and shall be clearly and durably marked on the side facing away from the road. The marker post shall be inscribed "X ducts" where X is the number of ducts laid in the group marked by the marker post.

. **2016 CULVERT MARKER POSTS**

Culvert markers shall be installed by the Contractor at each end of culverts constructed along the project road. The culvert marker shall be located immediately beyond the outer edge of the shoulder or footpath and as close to the line of the culvert as physical constraints permit. Where several culverts are laid side by side, only one culvert marker post will be necessary at each end of the culverts. The culvert marker posts shall be constructed as shown on the Drawings and shall be clearly and durably marked on the side facing away from the road. The marker post shall be inscribed "X culverts" where X is the number of culverts laid in the group marked by the marker post.

. **2017 BOLLARDS**

Where shown on the Drawings or instructed by the Engineer, the Contractor shall construct permanent bollards. The bollards shall be precast using a class of concrete as shown on the drawings.

. **2018 PLOT BOUNDARY BEACONS**

Where shown on the Drawings or instructed by the Engineer, the Contractor shall construct plot boundary beacons. The plot boundary beacons shall be 1.2m long reinforced concrete post with 150x150mm cross-section founded on 450x450x350 mass concrete as shown on the drawings.

. **2019 CHANNEL BLOCKS**

The Contractor shall provide, lay and joint 125mm x125 and 125mm x 250mm channel blocks to roads, footpaths and shoulders as shown on the Drawings or as instructed by the Engineer.

. **2021 MEASUREMENT AND PAYMENT**

Item: Reflective road studs

Unit: No

Road studs shall be measured by the number instructed and installed. The rate shall include for the cost of provision and transport of all materials, preparation of the road surface, application of adhesives and full compliance with the manufacturer's instructions.

Item: Road humps

Unit: m

Road humps shall be measured by the length installed. The rate shall include for provision, installation and compaction to the satisfaction of the Engineer and removal of surplus material.

Item: Flat topped zebra crossing

Unit: No

Flat topped zebra crossings shall be measured by the number instructed and installed. The rate shall include for all materials, labour and equipment, and all measures required in the construction of the crossing, in accordance with the drawings.

Item: Service ducts**Unit: m**

Service ducts shall be measured by the metre as the length of duct installed as per the Engineer's instructions. The rate shall include for providing all materials, excavation, installation of PVC ducts, backfilling to the formation level, compaction, all in accordance with clause 2015.

Item: Duct Marker Post**Unit: No**

Duct marker posts shall be measured by the number instructed and installed. The rate shall include for provision and installation of posts, all excavation and backfill, compaction to the satisfaction of the Engineer.

Item: Culvert marker post**Unit: No**

Culvert marker posts shall be measured by the number instructed and installed. The rate shall include for provision and installation of posts, all excavation and backfill, compaction to the satisfaction of the Engineer.

Item: Bollards:**Unit: No**

Bollards shall be measured by the number instructed and installed. The rate shall include for provision and installation of bollards, all excavation and backfill, compaction to the satisfaction of the Engineer.

Item: Plot boundary beacons**Unit: No**

Plot boundary beacons shall be measured by the number instructed and installed. The rate shall include provision, transport of materials, excavation, erection of beacons and backfill, compaction to the satisfaction of the Engineer.

Item: Channel blocks**Unit: m**

Channel blocks shall be measured by the length installed, in accordance with the drawings, or as instructed by the Engineer. The unit rate shall include for all excavation (including in hard materials) provision and placing of backing and bedding concrete, cutting of blocks as necessary, and placing of channel blocks to the line and level shown on the drawings or as instructed by the Engineer.

SECTION 21 - MISCELLANEOUS BRIDGE WORKS

2102 BRIDGE BEARINGS

(i) Elastomeric Laminated Bearing

Bearings shall be manufactured and installed in accordance with the details shown on the Drawings or as described in the Specification. And Unless otherwise specified, bridge bearings shall conform to BS 5400 part 9 or equivalent Eurocode BS EN 1337-2:2004, BS EN 1337-3:2005, BS EN 1337-5.

The levels shown on the Drawings are the soffit levels of the beams or deck at the bearing locations. Bearings shall be accurately set in their correct positions and shall be maintained in position during beam installation and deck construction. Bearing surfaces of bearings shall be kept free from contamination and after the deck has been completed, each bearing and the area around it shall be left clean.

All bearings shall be indelibly marked with the appropriate Type Numbers and shall be supplied complete with plates, dowels and dowel caps, nuts, bolts, adhesives, mortars and the like as required.

Should the contractor wish to use an alternative system to that shown on the drawings, he should provide the Engineer with full details and technical specifications of the alternative system and shall satisfy the Engineer with the suitability of the alternative system.

Bearings shall not be dispatched to the site until the tests described in the special specification have been satisfactorily completed and the certified results of the tests approved by the engineers.

(a) The installation of the bearings shall be as directed by the Engineer. Bearing shall be maintained in their correct position during the placing of the bridge deck.

(b) Mating surfaces of bearings shall be kept free from contamination and, after the deck has been completed; each bearing and the area around it shall be left clean.

(c) All bearing shall be indelibly marked with the appropriate Type Numbers and shall be supplied complete with dowels and dowel caps as required.

(d) The Contractor shall inform the Engineer at least 14 days in advance of the date of the manufacture of the bearing and of the date when tests to be carried out. All the requisite technical information about the bearings will accompany such requests.

(e) On completion of the manufacture of the bearings, the Contractor shall submit bearings selected by the Engineer, or specially manufactured bearings to serve as samples as authorised by the Engineer, to an independent testing authority for testing.

The testing facilities of the manufacturer or supplier may be used if so approved and on condition that the tests are conducted in the presence of the Engineer. The Engineer shall determine which tests are to be conducted, and the tests shall comply with the appropriate requirements of this Specification. Copies of test results and certificates for the above mentioned tests shall be submitted by the Contractor to the Engineer in good time to enable the Engineer to assess the information before the bearings are installed. The dimensional tolerances for the bearings shall comply with the requirements of this Specification.

Before the bearings are dispatched to the site of the Works, each bearing, shall be subjected simultaneously to a vertical load equal to 150% of the maximum design load, and to a shear distortion equal to 150% of the maximum design value. The bearings shall be visually inspected for defects by

the Engineer or his/her nominee and shall not at any stage under this test show any cracks visible to the naked eye or any other defects.

(f) Bearings shall not be dispatched to the site until the tests described in the Contract have been satisfactorily completed and the certified results of such tests approved by the Engineer.

The Contractor shall provide and place elastomeric bearings, designed in accordance with Eurocode, including mortars, adhesives and the like as required. The rate for bridge bearings shall include for the cost of providing, testing, Engineer's or third party inspections and installing the bridge bearing together with mortars, adhesives and the like as required.

(ii) Dowels and guides

Where dowels and guides are used in conjunction with bearings they shall not complicate or prevent the removal of the bearings.

(iii) Storage and handling

The bearings shall at all times be stored under cover and clear of the ground, away from sunlight, heat, oils and chemicals deleterious to the bearings. The bearings shall not be stacked in a manner or on a surface which will cause distortion of the bearings.

The bearings shall be handled with care to ensure that they are not subjected to impact loads or any other conditions which may be harmful.

(iv) Installation

The concrete surfaces of elements required to receive bearings shall comply with the requirements of this Specification. Plastering of the surface will not under any circumstances be permitted.

Before the mortar bedding is constructed, the concrete surface shall be chipped back to expose the aggregate and leave a sound irregular surface. Bonding of the mortar bedding to the concrete surface shall be in accordance with the manufacturer's recommendations and the Engineer's instructions.

Unless otherwise shown on the Drawings, the bearings shall be installed on a horizontal plane and shall be in full contact with the concrete and bedding surfaces.

The bearings shall be accurately installed to the specified level, alignment and orientation, all within the construction tolerances set out in this Specification and the details shown on the Drawings.

No separate payment will be made for the inspection of the bearings by the manufacturer or supplier and the issuing of the acceptance certificate.

. 2103 MOVEMENT JOINT ON DECK

The Contractor shall provide and install a suitable Expansion joint as approved by the Engineer. The expansion joint shall have a maximum movement capacity of 25mm.

. 2105 GUARDRAILS

Notwithstanding provisions to the contrary in the Standard Specifications, guardrails or safety parapet shall be erected on the bridge as detailed in the drawings and approved by the Engineer.

Guardrails and safety parapet shall be measured and paid for per linear meter.

. **2105 POLYCARBONATE ROOFING SHEETS**

The footbridges shall have a canopy made of U-Lite polycarbonate sheets or equivalent (min 10mm thick), with UV-resistant coating to prevent yellowing and degradation from sunlight with minimum 20 years guaranteed service from the manufacturer. The colour or shade shall be instructed by the Engineer.

Measurement shall be per square meter for provision, fixing and accessories necessary for installation, including any sample that may be requested by the Engineer.

SECTION 22 - DAYWORKS

. 2202 MEASUREMENTS AND PAYMENT

Add after the first paragraph of Clause (a) Plant:

Where items of major equipment listed in the schedule of Dayworks are specified by type (e.g. concrete mixer etc.) the power rating of such items of equipment to be provided by the Contractor shall not be lower than the power ratings of such equipment, manufactured within the last two years prior to the date of Tender. Any item of major plant employed upon Dayworks which has a power rating lower than specified 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.

SECTION 25 - HIV/AIDS, GENDER ISSUES, SOCIAL ISSUES AND LOCAL PARTICIPATION

. **2501 SCOPE OF THIS SECTION**

This specification sets out the Contractor's obligations with regard to on-site HIV/AIDS awareness campaign and preventive measures which are to be instituted.

. **2502 INTERPRETATION AND DOCUMENTATION**

The following documents shall inter-alia be read in conjunction with this Specification;

- i) The Instructions to Bidders
- ii) The Conditions of Contract
- iii) The Drawings

. **2503 GENERAL REQUIREMENTS**

a) HIV/AIDS Awareness Campaign

The Contractor shall institute an HIV/AIDS awareness campaign amongst his workers for the duration of the contract. As part of the campaign the Contractor will be required to display AIDS awareness posters in all buildings frequented by workers employed on the contract, where such buildings fall under the control of the Contractor. In addition, the Contractor will put at least ten HIV/AIDS awareness posters in the vehicles that are regularly used on site. The posters shall be printed on gloss paper and shall be at least A1 size on buildings and A3 size, or other approved size, on vehicles. The message on the posters shall be supplied by the Employer through the Engineer before the posters are printed.

AIDS awareness shall also be included in the orientation process of all workers employed on the contract.

b) AIDS Prevention Campaign

The Contractor shall institute an HIV/AIDS prevention campaign amongst his workers for the duration of the contract. As part of the campaign the Contractor will be required to make condoms available to workers. The condoms shall be from an approved manufacturer. The Contractor shall make available at least 4,000 condoms every month through dispensing machines or other approved method of distribution. The Contractor shall at all times keep the site adequately supplied with condoms.

c) HIV/AIDS Training Introduction

HIV/AIDS is having a significant and increasing impact in Kenya. Statistics show a prevalence of 10-15% along some of the major roads in the country. Interventions that stimulate the movement of people increase both the exposure to the HIV virus and the spread of the virus. Road construction has been identified as one such intervention.

MOR policy is to integrate HIV/AIDS awareness and prevention into all road construction and rehabilitation programmes. This is in accordance with the Third National Strategic Plan (2000-5) for HIV/AIDS prevention and control as approved by the Government of Kenya, International Bank for Reconstruction and Development (IBRD) and many other organizations.

It is a contractual requirement to carry out HIV/AIDS awareness and prevention activities during the construction period as provided in this specification.

The rehabilitation of the This Corridor will involve local labour and other Contractor's labour. It is a contractual requirement to carry out HIV/AIDS awareness and prevention activities during the construction period as stipulated in this Specification.

Objective

The objective is to reduce the risk of exposure to and spread of the HIV virus in the area of the construction. The target group will be local labourers and their supervisors employed by the works Contractors. The wider community will benefit indirectly through their normal day-to-day interaction with the target group.

Scope of activities

Activities for HIV/AIDS awareness and prevention will be broad-based targeting both individuals and groups. They may consist of:

- i). Information posters in public places both on and offsite (eating houses, bars, guest houses, vehicles etc.)
- ii). Availability of socially marketed condoms.
- iii). Peer educators (reference people) drawn from the local labour and educated in HIV/AIDS issues for discussions with colleagues (estimate 1 per 100 employees).
- iv). Small focus group discussions and information covering key issues
- v). Theatre groups and video presentations
- vi). Promotional events (such as sports to encourage openness and discussion of HIV/AIDS issues
- vii). Promotional billboards to raise awareness of the integration of construction and HIV/AIDS activities
- viii). Inclusion of HIV/AIDS activities at site meetings with the Provincial/District committees and other representatives
- ix). Availability of promotional material such as t-shirts, caps bumper stickers, key rings etc.

The scope of activities may be tailored as required to meet the perceived needs and priorities of the labourers, determined by participatory approaches to ensure they are appropriate desired and have a public health impact. The scale and frequency of activities may also be adjusted to suit requirements of the target group. Education will cover:

1. preventive behaviours including partner reduction, condom use, awareness and importance of treatment of Sexually Transmitted Infections (STIs);
2. skills including negotiating safer sex, correct condom use, purchase without embarrassment; and
3. referral to local health centres and available services.

Tasks to support the above activities will be to:

1. Establish the status and focus of all current and planned HIV/AIDS activities in the area to ensure complementarity and determine potential involvement in project activities.
2. Carry out a brief review of regional activities combining road construction with HIV/AIDS campaigns to determine options, best practice key issues, constraints, etc.

3. Review of Information, Education and Communication (IEC) materials available and their relevance to road construction, making recommendations for future development of IEC materials.
4. Provide education and training for site personnel, supervisors and peer educators for the scope of activities as above.
5. Provide supervision for peer educators to ensure sustained quality of education. Incentives for their continual work may be small promotional items such as t-shirts, caps, etc.
6. Provide mechanisms for the social marketing of condoms and distribution of materials.
7. Monitor activities regularly to assess effectiveness and impact. This should include an initial, interim and final assessment of basic Knowledge, Attitude and Practices (KAP) taking account of existing data sources and recognising the limitations due to the short time frame to show behaviour change. The KAP will be supported by qualitative information from focus group discussions.

Collaboration

HIV/AIDS activities are co-ordinated nationally by the National Aids Control Council (NACC). MoR, in consultation with NACC and the Ministry of Health (MoH), will co-ordinate with the provincial, district and local representatives. Representatives of local health authorities will be invited to attend training and communication activities.

Activities on the construction site will be linked as far as possible with on-going HIV/AIDS awareness and prevention in the area. This will ensure complementarity of approaches, reinforcing education and minimising duplication. In addition, these links will ensure that the target group will have access to continued information after the end of the construction period.

Contractor Responsibilities

The Contractor will employ and designate a qualified HIV/AIDS expert to be approved by the Engineer, who will work closely with the Client, MoR and other implementing agencies to support the HIV/AIDS awareness and prevention activities. This will ensure maximum effectiveness and integration with construction activities. Specific, but not exclusive, issues to be addressed by the Contractor are:

Scheduling of appropriate timing and duration for the implementation of HIV/AIDS activities as part of work plan for labourers and supervisors. Designated rest times such as lunch breaks and pay days should be excluded.

Identification of suitable individuals for education from recruitment records for education with the implementing organisation.

Provision of suitable sites for communication activities and for condom distribution.

Monitoring the implementation of peer educational activities.

Provision of necessary support to the implementing organisation.

The Contractor shall be actively involved in the liaison and coordination associated with the provision and implementation of the HIV/AIDS awareness and education program.

Inputs

An organisation experienced in the provision of HIV/AIDS awareness and prevention activities will be selected as a Sub-Contractor to provide the above scope of activities on behalf of the main Contractor.

Reporting

The implementing organisation will produce the following reports to be submitted to the Contractor, Consultants, MoR and NACC:

- Monthly progress briefs for inclusion in site meetings.
- Quarterly reports detailing activities carried out, issues, follow up, etc.
- Review report of activities in the road construction sector,
- Review report of existing IEC materials with recommendations for development of materials specifically for the road sector.
- Final report detailing the methodology and activities carried out under this project including lessons learnt, impact, liaison with the Contractor and other parties, etc.

In addition, a report with the recommended approach for integration of HIV/AIDS awareness and prevention activities in the road construction sector will be produced. This will be a synthesis of project activities including contractual approaches, communication activities, availability of materials, liaison with existing organisations, etc. It will be developed with all parties involved in the construction activities to ensure the wide range of views and experiences is gained.

The final report and recommended approach will be presented to MoR, NACC and other interested organisations including private sector, funding agencies and NGO's.

Timing

Activities shall commence at the start of the construction period and continue throughout the thirty (30) months to ensure a sustained impact. Reporting and dissemination activities shall continue for three months after the project is completed to ensure integration into current practice.

. 2504 MEASUREMENT AND PAYMENT

Section I of the Bill of Quantities contains a prime cost sum for the provision of a HIV/AIDS awareness campaign, plus a percentage for the Contractor's liaison and coordination, overheads and profit associated with the provision and implementation of this campaign.

SECTION 26 – ROAD SAFETY CAMPAIGN

. **2601 SCOPE OF THIS SECTION**

This specification sets out the Contractor's obligations with regard to on-site road safety campaign which is to be conducted during the construction period. The aim of this road safety campaign is to achieve safe road use in the project area.

Indeed, an improved roadway complete with paved surface will undoubtedly encourage more vehicular traffic and will allow vehicles to travel at higher average speeds. This will increase the possibility for accidents between vehicles, and with non-motorized traffic such as cyclists, pedestrians and both domestic and wild animals.

Although the improved road will be wider in certain areas and dangerous curves will be straightened, thus making it safer to travel at higher speeds, there is still likelihood of collisions between vehicles and with vehicles and bicycles, pedestrians, and livestock (and wildlife).

Due to poor road conditions over the years, people, animals, NMTs, and particularly children are unaware of the danger of a fast approaching vehicle and may cross the road in front of it. This impact is likely to be serious during daytime hours when traffic is heavier and when drivers are able to move faster.

Thus, the Contractor shall conduct a road safety campaign in order to increase the awareness of the dangers of the road among the communities living alongside the project road, and the Consultant's workers.

. **2602 GENERAL REQUIREMENTS**

(a) Road safety prevention campaign

The Contractor shall institute a road safety campaign amongst his workers, and the communities living alongside the road, for the duration of the contract. . As part of the campaign the Contractor will be required to display road safety posters in all buildings frequented by workers employed on the contract, where such buildings fall under the control of the Contractor, and in all schools and public buildings within the road project area. In addition, at least three (3) of the Contractor's vehicles, regularly used on site shall display road safety posters. The posters shall be printed on gross paper and shall be at least A1 size on buildings and A3 size, or other approved size on vehicles. The message on the posters shall be supplied by the Employer through the Engineer before the posters are printed.

(b) Road safety training

- **Objective**

The objective of the road safety campaign is to reduce the risk of exposure to road accidents in the area of the road. The target groups will be the public alongside the road, especially the children in schools and the chiefs of the village, but also local labourers and their supervisors employed by the works contractors. The wider community will benefit indirectly through their normal day-to-day interaction with the target groups.

- **Scope of activities**

Activities for road safety awareness will be broad-based targeting both individuals and groups. They may consist of:

- i. Information posters in public places both on and offsite (eating houses, bars, guest houses, etc.) and on contractor's vehicles,
- ii. Peer educators (reference people) drawn from the local labour, and from the local communities, and educated in road safety issues for discussions with colleagues or the local community members,
- iii. Small focus group discussions and information covering key issues,
- iv. Theatre groups and video presentations,
- v. Promotional events (such as football matches) to encourage openness and discussion of road safety issues,
- vi. Promotional bill boards to raise awareness of the integration of construction and road safety activities,
- vii. Availability of promotional materials such as T-shirts, caps, bumper stickers, key rings, etc.

The scope of activities may be tailored as required to meet the perceived needs and priorities of the local communities and the workers, determined by participatory approaches to ensure they are appropriate, desired and have a public impact. The scale and frequency of activities may also be adjusted to suit requirements of the target groups. Education will cover:

- preventive behaviours including safe road crossing, walking on shoulders and not on the road;
- referral to local information centres and services available.

Tasks to support the above activities will be to:

- (ii) Establish the status and focus of all current and planned road safety campaign activities in the area to ensure complementarity and determine potential involvement in project activities.
- (iii) Carry out a brief review of regional activities combining road construction with road safety campaigns to determine options, best practice key issues, constraints, etc.
- (iv) Review of Information, Education and Communication (IEC) materials available and their relevance to road construction, making recommendations for future development of IEC materials.
- (v) Provide education and training for site personnel, supervisors, local community members, and peer educators for the scope of activities as above.
- (vi) Provide supervision for peer educators to ensure sustained quality of education. Incentives for their continual work may be small promotional items such as T-shirts, caps, etc.
- (vii) Monitor activities regularly to assess their effectiveness and impact. This should include an initial, interim and final assessment of basic knowledge, attitude and practices (KAP) taking account of existing data sources and recognising the limitations due to the short time frame to show behaviour change. The KAP will be supported by qualitative information from focus group discussions.

- **Contractor's Responsibilities**

The Contractor will designate a qualified road safety expert, to be approved by the Engineer, who will work closely with the Client, MOR and other implementing agencies to support the road safety campaign activities. This will ensure maximum effectiveness and integration with construction activities. Specific but not exclusive issues to be addressed by the Contractor are:

- i).Scheduling of appropriate timing and duration for the implementation of the road safety campaign as part the workplan.
- ii).Identification of suitable individuals for education from recruitment records with the implementing organization and from within the local communities.
- iii).Provision of suitable sites for communication activities.
- iv). Monitoring of the implementation of peer educator activities.
- v).Provision of support as necessary to the implementing organization and local communities.

Inputs

An organisation experienced in the provision of road safety campaigns will be selected as a subcontractor to provide the above scope of activities on behalf of the main Contractor.

Reporting

The implementing organisation will produce the following reports to be submitted to the Contractor, the Engineer, and the Employer:

- i). monthly progress briefs for inclusion in site meetings.
- ii). quarterly reports detailing activities carried out, issues, follow ups, etc.
- iii). a review report of activities in the road construction sector,
- iv). a review report of existing IEC materials with recommendations for development of materials specifically for the road sector.
- v). a final report detailing the methodology and activities carried out under this project including lessons learnt, impact, liaison with the Contractor and other parties, etc.

Timing

Activities shall commence at the start of the construction period and continue through out the Contract duration to ensure a sustained impact. Reporting and dissemination activities shall continue for three months after the project is completed to ensure integration into current practice.

. **2603 MEASUREMENT AND PAYMENT**

The payment for items in this clause shall include full compensation for all work associated with the provision of road safety campaign related services as specified.

Item: Instituting a Road Safety Awareness Campaign

Unit: months

The unit of measurement shall be the calendar month or part thereof, measured over the duration of the campaign. The tendered rate shall include full compensation for equipment, labour and material required for the provision of the service.

Item: Instituting an Accident Prevention Campaign

Unit: months

The unit of measurement shall be the calendar month or part thereof, measured over the duration of the campaign. The tendered rate shall include full compensation for equipment, labour and material required for the provision of the service.

Item: Road Safety Training

Unit: Provisional Sum

Compensation for road safety specialists for the implementation of the Training element of Clause 26 03 (b)

Any amount required under this item will be approved by the Engineer, prior to expenditure. Handling costs and profit in respect of this sub-item will be paid as a percentage (%) of the Provisional Sum expended.