Default of Employer

Default of Employer

69.1 AMEND Sub-Clause 69.1 - Default of Employer:

Paragraph (a) delete "28 days" and insert "48 days".

DELETE paragraph (c) and re-number paragraph (d) as (c).

Changes in cost and Legislation

Increase or Decrease of Cost

70.1 Delete the text of the Sub-Clause and substitute:

Adjustments to the Contract Price shall be made in respect of rise or fall in the cost of local labour and specified materials as set out in this Sub-Clause.

(a) Local Workmen

(i) For the purpose of this Sub-Clause:
"Local Workmen" means skilled, semi-skilled and unskilled workmen of all trades engaged by the Contractor on the Site for the purpose of or in connection with the Contract or engaged full time by the Contractor off the Site for the purpose of or in connection with the Contract (by way of illustration but not limitation: workmen engaged full time in any office, store, workshop or quarry). "Basic Rate" means the applicable basic minimum wage rate prevailing on the date 28 days prior to the latest date for submission of tenders by reason of any National or State Statute, Ordinance, Decree or other Law or any regulations or bye-law of any local or other duly constituted authority, or in order to conform with practice amongst good employers generally in the area where the Works are to be carried out.
"Current Rate" means the applicable basic minimum wage rate for Local Workmen prevailing on any date subsequent to the date 28 days prior to the latest date set for submission of tenders by reason of any National or State Statute, Ordinance, Decree or other Law or any regulation or bye-law of any local or other duly constituted authority, or in order to conform with practice amongst good employers generally in the area where the works are to be carried out.

(ii) The adjustment to the Contract Price under the terms of this Sub-Clause shall be calculated by multiplying the difference between the Basic and Current Rates for Local workmen by:
(a) the number of all hours actually worked, and also
(b) in respect of those hours worked at overtime rates, by the product of the number of said hours and the percentage addition required by the law to be paid by the Contractor for overtime, providing the overtime hours were not worked at night as defined in Sub-Clause 45.1.

(iii) No other adjustment of the Contract Price on account of fluctuation in the remuneration of Local Workmen shall be made.

b) Specified Materials

(i) For the purpose of this Sub-Clause:
"Specified Materials" means the materials stated in the Schedule of Basic Rates (Schedule 2 in the Schedules of Supplementary Information) and required on the Site for the execution and completion of the Works.

"Basic Prices" means the current prices for the Specified Materials prevailing on the date 28 days prior to the latest date for submission of tenders.

"Current Prices" means the current prices for the specified materials prevailing at any date subsequent to the date 28 days prior to the latest date for submission of tenders. The Contractor shall furnish with his tender written confirmation from his suppliers or manufacturers of prices for the supply of these materials 28 days prior to the final date for submission of Tenders and shall enter these in the Schedule of Basic Prices in the Schedules of Supplementary Information.

For locally produced materials, the supplier's or manufacturer's prices shall be at their nearest depot or the nearest railway station relevant to the Works.

The prices quoted will be scrutinized during the Tender evaluation. Any discrepancy from that which is deemed to be the correct price will be subject to adjustment by the Engineer prior to award of Contract, or at such later date as discrepancies become apparent.

(ii) The adjustment to the Contract Price under the terms of this Sub-Clause shall be calculated by applying the difference between the Basic and Current Prices to the quantity of the appropriate Specified Material which is delivered to the Site during the period for which the particular Current Price is effective. Such adjustment may be either an addition to or a deduction from the Contract Price.

(iii) The Contractor shall use due diligence to ensure that excessive wastage of the Specified Materials shall not occur. Any Specified Materials removed from the Site shall be clearly identified in the records required under paragraph (d) of this Sub-Clause.

(iv) The provisions of this Sub-Clause shall apply to fuels used in Contractor's Equipment engaged on the Site for the purposes of executing the Works, including vehicles owned by the Contractor (or hired by him under long term arrangements under which the Contractor is obligated to supply fuel) engaged in transporting any staff, labour, Contractor's Equipment, Temporary Works, Plant or materials to and from the Site. Such fuels shall be clearly identified in the records required under paragraph (d) of this Sub-Clause. The provisions of this Sub-Clause shall not apply to any fuels sold or supplied to any employee of the Contractor or to any person for use in any motor vehicle not being used for the purposes of the Contract.

(v) The Contractor shall at all times have regard to suitable markets and shall, whenever buying materials a variation in the cost of which would give rise to an adjustment of the Contract Price under this Sub-Clause, be diligent to buy or procure the same at the most economical prices as are consistent with the due performance by the Contractor of his obligations under the Contract.

If at any time there shall have been any lack of diligence, default or negligence on the part of the Contractor, whether in observing the above requirements or otherwise, then, for the purposes of adjusting the Contract Price pursuant hereto, no account shall be taken of any increase in cost which may be attributable to such lack of diligence, default or negligence and the amount by which any cost would have been decreased but for such lack of diligence, default or negligence shall be deducted from the Contract Price.

(vi) No other adjustment to the Contract Price on account of fluctuation in the cost of materials shall be made.

c) *Overheads and Profits Excluded*

In determining the amount of any adjustment to the Contract Price pursuant to this Sub-Clause no account shall be taken of any overheads or profits.

d) *Notices and Records*
The Contractor shall forthwith, upon the happening of any event which may or may be likely to give rise to adjustment of the Contract Price pursuant to this Sub-Clause, give notice thereof to the Engineer and the Contractor shall keep such books, accounts and other documents and records as are necessary to enable adjustment under this Sub-Clause to be made and shall, at the request of the Engineer, furnish any invoices, accounts, documents or records so kept and such other information as the Engineer may require.

e) *Adjustment after Date of Completion*
Adjustment to the Contract Price, after the due date for completion of the whole of the Works pursuant to Clause 43, or after the date of completion of the whole of the Works certified pursuant to Clause 48, shall be made in accordance with Current Rates or Current Prices, as applicable, ruling at the due date for completion or the date stated in the Taking-Over Certificate, whichever is the earlier.

f) *Determination of Adjustment to Contract Price*
The amount of any adjustment to the Contract Price pursuant to this Sub-Clause shall be determined by the Engineer in accordance with the foregoing rules.

g) *All payments made under this Sub-Clause shall be in the currencies and in the proportions defined in Sub-Clause 60.13.*

h) *No payments will be made for the cost of preparing variation of price (VOP) claims.*

Currency and Rates of Exchange

72 ADD to Sub-Clause 72.1

Rates of Exchange

72.1 *The rates of exchange with the foreign currencylies selected by the Contractor shall remain fixed for the duration of the Contract.*

The rates of exchange applicable for calculating the payment of such proportions or amount shall be those prevailing, as determined by the Central Bank of Kenya on the date 28 days prior to the latest date for the submission of Tenders for the Contract, as will be notified to the Contractor by the Employer prior to the submission of tenders or as provided for in the Tender.

Currency Portions

72.2 DELETE Sub-Clause 72.2 and substitute:

The proportion of foreign currency shall remain fixed for the duration of the Contract.

Duties, and Taxation

73 ADD Clause 73.1 as follows:

Duties, dues etc.

73.1 *The Contractor shall list in Schedule 6 of the Schedules of Supplementary Information the plant and equipment which he proposes to import for execution of the Works. The Engineer will consider the list in the context of the work to be performed and will give his approval subject to any modification to the list he may see fit to make. No appeal against the Engineer's decision shall be permitted.*

73.2 *The Contractor will be permitted to import approved plant, vehicles and equipment of OECF designated eligible countries manufacture required for the execution of the Works on the basis of temporary admission into Kenya and re-export of the same thereafter upon completion of the Contract without payment of Customs Duties and Value Added Tax. If the plant, vehicles and equipment is not re-exported, duties and taxes shall then be paid based upon their residual value at the date of the completion of the Contract, or the date of withdrawal from the Works, whichever is earlier. Plant, vehicles and equipment so imported shall not be utilised on other Works not associated with the Contract, unless specifically authorised by the Engineer.*

73.3 *The same conditions in Sub-Clause 73.2 shall apply to items of approved plant and equipment with an on-site value in excess of 60,000 Kenyan Shillings which the Contractor already owns, wishes to import, and is not of OECF eligible countries' manufacture.*

73.4 *The Contractor will be permitted to import spare parts and tyres and tubes of OECF eligible countries' manufacture for maintenance of his plant and equipment, without payment of Customs Duty and Value Added Tax provided that their total value does not exceed 15% of the Contract Price. Items which are otherwise produced in Kenya will not be permitted to be imported without payment of customs duty and Value Added Tax.*

73.5 *The Employer will apply for exemption from Customs Duties and Value Added Tax in respect of all goods and consumables imported directly by the Contractor for use in the performance of the Contract including construction equipment, vehicles, spare parts and materials.*

The following documents shall be provided as they become available:-
(1) Copy of relevant import entry form(s)
(2) Copy of shipping invoice(s)
(3) Copy of Bill(s) of Lading.

Failure to produce these documents is likely to delay relevant payments to the Contractor and in such a case Clause 60.10 shall not apply to the amount concerned.

Whenever the Contractor purchases scheduled goods locally for use in the performance of the contract they shall be zero-rated for Value Added Tax, since locally purchased goods do not invite duty. Clause 73.7 refers.

Custom Duties and Value Added Tax on all other items including personal vehicles, personal effects and local purchases, will be neither exempt nor zero-rated.

The Contractor shall obtain all necessary Import Licences and carry out all administrative work in connection with his imports.

An advance list of the contents of each shipment and its C.I.F. valuation shall be sent by airmail as soon as possible after despatch of the goods and submitted to the Employer via the Engineer immediately on receipt. The Employer will not bear any costs, delays or demurrage charges.

73.6 *All materials of OECF eligible countries manufacture, approved by the Engineer to be incorporated into the Works, shall be free of Customs Duties and Valued Added Tax. The Contractor shall submit a list of such materials required with the Tender, and shall be required to satisfy the Engineer that such materials have been actually incorporated into the Works. Materials which are otherwise produced in Kenya will not be permitted to be imported without payments of Customs Duties and Value Added taxes.*

73.7 *Certain scheduled items purchased within Kenya solely for the execution of the Nairobi Bypass Road Contract shall be zero-rated in respect of Value Added Tax in accordance with the VAT Act 1989 as amended in the Finance (No.2) bill 1990. Scheduled items are restricted to the following:*

Fuels and Lubricants
Bitumens and Emulsions
Lime
Reinforcing steel
Filter fabric
Guardrail

Contractor's Expatriate Staff

73.8 *The Contractor and his staff shall be liable to pay all income and other taxes as required by the regulations which may be in force during the period of the Contract. Notwithstanding the above, the Contractor shall be permitted to employ OECF eligible countries' nationality staff as approved by the Engineer and these shall be permitted to:*

a) Draw salaries and emoluments without payment of income tax in Kenya.

b) Be exempted from payment of fees in respect of entry permit/dependent passes, re-entry passes and work permits.

c) Be exempted, during the first six months following the date of arrival in Kenya, from customs duties and other taxes for the importation of their personal effects, including one motor car. If such motor car shall not be re-exported, duties and taxes shall then be paid based on its residual value at the date of completion of the Contract or the date of the expatriate employee's withdrawal from employment upon the Works, whichever is earlier.

Damage to Public Services

74.1 *The Contractor shall be held liable for all damages and interference to the public and private facilities including roads, bridges and drains and pipes, and electric power cables or telephone lines of any kind either above or below ground caused by him or his Subcontractors in the execution of the Works. Should any damage be done to roads, bridges drains, pipes, wires, telephone, telegraph, or electric light services, etc., whether or not shown on the Drawings, the Contractor must make good the same without delay and do any further work considered necessary by the Engineer, all at his own cost. The Contractor shall be deemed to have provided for these contingencies in fixing the rates and prices tendered in the Bill of Quantities.*

Explosives

75.1 *(a) No explosives and detonating materials shall be imported.*

(b) The transportation, storage and use of explosives shall be governed by the regulations of Kenya and any modifications made thereto during the period of the Contract.

(c) The Contractor shall be responsible for all costs incurred in complying with regulations concerning the storage, transport and handling of explosives.

Bribes

76.1 ADD Sub-Clause 76.1

If the Contractor or any of his Sub-Contractors, agents or servants offers to give or agrees to offer or give to any person, any bribe, gift, gratuity or commission as an inducement or reward for doing or forbearing to do any action in relation the Contract or any other contract with the Employer or for showing or forbearing to show favour or disfavour to any person in relation to the Contract or any other contract contract with the Employer, then the Employer may enter upon the Site and the Works and terminate the Employment of the Contractor and the provisions of Clause 63 hereof shall apply as if such entry and termination had been made pursuant to that Clause.

Advertising

77.1 *(a) Any advertising mentioning g the subject of this Contract must be approved by the Employer, which approval will not be unreasonably withheld, prior to publication.*

(b) The Contractor shall not exhibit, or permit to be exhibited, any advertisements on the Site, or on construction equipment without the approval of the Employer.

Individuals not Personally Liable

78.1 *No member or officer of the Employer nor the Engineer's Representative nor any one of the respective staffs or employees of the Employer and the Engineer shall be in any way personally bound or liable for the acts or obligations of the Employer under the Contract or answerable for any default or omission of the Employer in the observance or performance of any of the acts, matters or things which are herein contained.*

Photographs

79.1 *No photographs of the Site or of the Works or any part thereof or anything therein shall be published or otherwise circulated without the permission of the Employer.*

Details to be Confidential

80 ADD Sub-Clause 75.1

80.1 *The Contractor shall treat the details of the Contract as private and confidential, save in so far as may be necessary for the purposes thereof, and shall not publish or disclose the same or any particulars thereof in any trade or technical paper or elsewhere without the previous consent in writing of the Employer or the Engineer. If any dispute arises as to the necessity of any publication or disclosure for the purpose of the Contract the same shall be referred to the decision of the Employer whose award shall be final.*

Limitation as to Source of Supply

81.1 *The Contractor shall make expenditures for the purposes of the Contract and shall procure goods and services solely from eligible source countries as defined in the "Guidelines for Procurement under OECF Loans". The Contractor shall furnish full information concerning the origin of the goods and services to the Engineer before importation.*

Joint and Several Liability

81.1 *If the Contractor is a joint venture of two or more persons, all such persons shall be jointly and severally bound to the Employer for the fulfilment of the terms of the Contract and shall designate one of such persons to act as leader with authority to bind the joint venture. The composition or the constitution of the joint venture shall not be altered without the prior consent of the Employer.*

Special Requirements in Relation to the Kenya Railways Corporation Work in the Vicinity of Railway Tracks

Definition **82.1** *"The Corporation" means the Kenya Railways Corporation, a Corporation established under the provisions of the Kenya Railways Corporation Act, 1978.*

"The Corporation Engineer" means the Chief Civil Engineer of Kenya Railways Corporation, or such other officer (sometimes designated as "Engineer's Representative") acting on his behalf, who may be the District Civil Engineer, the Resident Engineer or other Corporate authority of such officer.

Occupation of Corporation's Land **82.2** *The Contractor will, from time to time be put in possession of so much of the Corporation's land as has been agreed for the work and shall, if required to do so, provide and maintain to the satisfaction of the Corporation's Engineer temporary fencing of approved type to prevent trespass on the Railway.*

Access for Corporation for Corporation's Employees **82.3** *The Corporation's Engineer or his representative shall at all times have free access to any premises where work is being carried out or materials prepared or manufactured for the Contract. The Contractor shall also provide safe access adequately lighted and all reasonable facilities to employees of the Corporation having right of access to the ground, premises and works affected under the Contract.*

Crossing of Tracks and Interference with Traffic **82.4** *The Contractor's workmen shall not be allowed to cross or convey material across the railway lines other than at an existing level crossing except under such special conditions as the Corporation's Engineer may from time to time have previously approved in writing. The Contractor's proposed method of working shall have been previously approved in writing by the Corporation's Engineer and the work shall be carried out in such a manner as not to endanger or interfere in any way with the railways of the Corporation or the traffic thereon. The Contractor shall strictly observe any rules or regulations or instructions which he may from time to time receive from the Corporation's Engineer for the working and protection of such traffic.*

Interference with Drains & Services **82.5** *Prior to the commencement of any works which may in any way affect any drains, mains, pipes or other services of the Corporation, the Contractor shall, to the complete satisfaction of the Corporation's Engineer either temporarily support and maintain the same or provide and maintain temporary diversions. Any springs, water course or drains which may be interfered with or cut through shall be preserved and pipes and other means be provided so as not to stop or diminish their present usage, and should any drains or springs appear, adequate measures shall be provided to convey the water and soil therefrom to a suitable outlet and every precaution taken to protect the Corporation's works and property from injury. The Contractor shall not be allowed without the prior approval in writing of the Corporation's Engineer to make temporary or permanent connections to the railway mains, drains, pipes or other services.*

Excavation Adjacent to Tracks **82.6** *The Contractor shall not commence any excavation near any railway line or railway structure until the track has been adequately strengthened or precautions taken to maintain the stability of the track/or structures and permission given by the Corporation's Engineer in writing for the work to proceed.*

Occupation of Tracks **82.7** *The Contractor's attention is particularly drawn to any dates and times for possession of the line embodied in the Contract or as may be laid down by the Corporation's Engineer.*

Contractor to Give Notice **82.8** *Before commencing any work adjacent to lines or sidings the Contractor shall give at least two (2) weeks notice in writing to the Corporation's Engineer and obtain his prior consent to commence work. When such notice shall have been received by the Corporation's Engineer, if he considers that lookout-men and/or hand-signalmen are necessary for the protection of the Contractor's employees and/or the Corporation's traffic he will so inform the Contractor and shall provide such lookout-men and/or hand-signalmen as he considers necessary and the Contractor shall only proceed with the work when the lookout-men and/or hand-signalmen have been provided and while they are in position and acting as such. Every notice must describe the nature and location of the work proposed to be carried out and its estimated duration.*

Hand-signalmen and Lookoutmen **82.9** *The Corporation's Engineer will provide such Inspectors, Lookoutmen and Handsignalmen as he may consider necessary for inspecting the work and protecting the traffic of the railway during the execution thereof.*

Temporary Work **82.10** *Any temporary structure or formwork erected over or close to the railway shall be constructed to a design and strength to be approved by the Corporation's Engineer with such clearance as he shall stipulate and in accordance with such drawings as he shall require and approve.*

Work Over Tracks **82.11** *The unloading at site and erection of any superstructure or temporary works adjacent to or over the railway must be carried out on dates and at times agreed to or to be agreed in writing between the Contractor and the Corporation's Engineer and under the supervision of the Corporation's Engineer.*

Use of Mechanical Plant **82.12** *No cranes or mechanical plant shall be allowed to work on or within reach of the railway except under such restrictions as the Corporation's Engineer may impose for the protection of railway traffic and in no circumstances will cranes or mechanical plant be allowed to work after the approach of a train has been signalled or warning given of the approach of train until such train has been passed and signalled clear of the site of the work. The Contractor will be responsible for taking every precaution to avoid risk or damage to the Corporation's traffic, passengers, employees, plant or equipment.*

Use of Explosives **82.13** *Explosives shall not be used in connection with the work without the written consent of the Corporation's Engineer and then only under such conditions as he may impose.*

Blasting **82.14** *Blasting when permitted by the Corporation's Engineer, shall be carried out at fixed hours during the day. In such cases the Engineer shall issue definite orders fixing the hours at which blasting will be permitted, and no blasting will be carried out at any other time. All operations involving the use of explosives and in particular, any blasting operations shall be carried out (with the prior approval of the Corporation's Engineer) in conformity with the requirements of the Explosives Ordinance and Regulations in force in Kenya. Explosives shall not be brought to or stored upon the site or on or adjacent to Railway property except and until magazines which comply with the Explosives Ordinance have been constructed or provided. The Contractor shall use such sizes of individual charges and locate them so that the minimum of disturbance is caused to the rock in the finished face of cuttings. In particular, should he require to blast in cuttings in shale or shattered rock, charges shall not be placed closer than 2m to the finished face of the cutting in the primary blast. Trimming off shall then be completed with individual charges or by hand.*

Accidents **82.15** *In populated areas or adjacent to railway lines which are open to public traffic, blasting shall be carried out strictly in accordance with the above instructions. In the event of an accident occurring during the performance of blasting operations, the contractor must immediately report the same to the Engineer's Representative by telegram if possible. A detailed report in writing must, in every case, be submitted to the Engineer's Representative as soon as possible after the occurrence of the accident. Accident reports should contain the following information:-*

(i) Mileage or station, or both, at which the accident occurred.
(ii) Time and date of accident
(iii) Nature of accident
(iv) Number of people killed or injured.
(v) Cause of accident.

Supple-mentary Regulations **82.16** *The Engineer's Representative is empowered to make any further regulations he may think necessary for the safety of the Works or for the protection of persons or property in the vicinity of the Works.*

Stacking of Materials, Etc. **82.17** *The Contractor shall stack and place all materials, plant and appliances in such a manner as to prevent their causing danger, injury or damage to persons or property and at a safe distance from railway tracks or platform edges, (normally not less than 2 metres). The Contractor shall also strictly observe any instructions given by the Corporation's Engineer as to the precautions to be taken and the distance from railway tracks and platform edges within which materials, plant and appliances may not be stacked or placed.*

Screening of Lights **82.18** *All lights provided by the Corporation shall be so placed or screened as not to interfere with any signal lights on the Corporation's railway and any temporary or permanent works which may interfere with the sighting of the Corporation's signals shall not be erected without the consent of the Corporation's Engineer.*

Contractor's Liability **82.20** *Notwithstanding the various controls permits and general supervision which the Corporation's Engineer may operate in respect of the Contractors' work, it is to be clearly understood that the responsibility for taking and maintaining all measures necessary for the protection of personnel and property (of whatever origin or ownership) rests entirely upon the Contractor, and he shall be fully liable for any injury, damage or accident arising as a consequence of his action, default or negligence in any respect. Where the Corporation's Engineer and/or the Corporation are committed to provide any measures or assistance in this respect such as lookout-men, hand-signalmen, level crossings, access points etc, it shall be the Contractors responsibility to make timely application to the Corporation's Engineer for such provision and he shall not proceed with his works unless and until such provision is in location and operative. The Corporation will not be responsible for any liability arising out of the Contractors failure in any of these respects.*

SPECIAL SPECIFICATIONS

NAIROBI BYPASS ROAD PROJECT

INDEX TO SPECIAL SPECIFICATIONS

SECTION 23 - PILING

SPECIAL SPECIFICATIONS

SECTION 1 - GENERAL

101 LOCATION AND EXTENT OF SITE

The Nairobi Bypass will be a new dual carriageway Class A International Trunk Road (Expressway) which will form part of the future Trans-African Highway. The Nairobi Bypass will be approximately 29.2 km long and will be situated in the City of Nairobi and the Kikuyu Division of Kiambu District, Central Province. It will start from the Mombasa Road near the eastern gateway of Nairobi National Park, and will terminate at the Nairobi-Nakuru road on the western outskirts of Kikuyu town.

The roadworks will include construction of six interchanges and a variety of small drainage structures.

The project area is located at an altitude of 1,700 to 2,000 metres above sea level with a predominantly dry climate except for two rainy seasons from March to June and from the end of October to December.

The Site is marked on the ground by wooden centre-line pegs and limits to right-of-way pegs. Traverse stations and benchmarks are also available for re-establishing the alignment during construction.

102 EXTENT OF THE CONTRACT

The following is a summary of of the works included in the Contract:

1) Provision and maintenance of vehicles, offices, laboratory, and equipment for the Resident Engineer and his staff;

2) Accommodation of public traffic passing through or around the works;

3) Site clearance and construction of earthworks for the new dual carriageway, slip roads, approach roads and service roads;

4) Construction of crushed stone, lean concrete and bituminous pavements to the dual carriageway; slip roads, approach roads and service roads;

5) Construction of one railway over road bridge relocation, four road over road bridges, and seven box culverts for road crossings;

6) Construction of pedestrian under-passes and footbridges;

7) Operations ancillary to the main works;

8) Diversion of services as requires;

9) Finishing of the roadway, grassing of slopes, and planting of the trees and shrubs;

10) Maintenance of the Works during construction period and the twelve months following completion of the Works.

103 DRAWINGS

The Drawings referred to in the General Conditions of Contract as issued with these Contract documents are listed after the index to this Special Specification. These Drawings are however subject to modifications and additions as described in the General Conditions of Contract.

The Drawings have been bound in a folio issued with the Tender Documents. The successful Contractor will be issued with two other sets of normal scale Drawings. In addition to these Drawings, further working Drawings will be issued by the Engineer from time to time as necessary for the proper execution of the Works.

It shall be the Contractor's responsibility to construct all Works in conformity with the latest revision, amendment or superseding Drawings current at the time of construction of such works.

Additional copies of the Drawings may be purchased by the Contractor when required.

For the convenience of Tenderers, full size drawings and the relevant manuals and specifications are available for inspection during the tender period at the offices of the Chief Engineer (Roads), Ministry of Public Works, Nairobi.

107 CERTIFICATES OF COMPLETION

Certificates of Completion shall only be issued for major sections of the Works between intersections subject to the conditions stated in the second paragraph of Clause 107 of the Standard Specification.

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. Should the Engineer's Junior Staff be required for any reason whatsoever which relates to the supervision of the Works, to work hours which are additional to the normal working hours herein defined, the full cost of such overtime shall be reimbursed by the Contractor to the Engineer at no extra cost to the Employer. In addition a 25% additional amount shall be paid to the Engineer to cover his administrative costs.

The Engineer's Junior Staff will generally comprise the following:

Designation	Number
Surveyor	1
Senior Inspector	1
Senior Lab. Technician	1
Inspector	6
Lab. Technician	4
Asst. Lab. Technician	4
Leveller	1
Draftsman	1
Typist	1
Clerk	1

121 PROTECTION, REMOVAL AND RELOCATION OF UTILITIES

The utilities and services to be relocated are shown on the Reference Drawings bound with the Drawings. In all cases the Contractor shall be entirely responsible for making arrangements for their relocation to be made with the authorities concerned; protecting all such utilities and services before, during and after construction of the road works; assisting the authorities where necessary; complying with their requirements and specifications, obtaining the Engineer's approval to estimates and method statements and making all necessary payments. Payment will be made against PC Sums provided in Bill Item 1.12 (1) to (8).

Works in the vicinity of the railway line shall be carried out in strict adherence to Clause 82 of the Conditions of Contract.

124 PROVISION OF LAND

1) Rectification of Title Deeds of Acquired Land

Properties acquired during construction of the road will require rectification of their title deeds with the Commissioner of Lands.

The Contractor shall pay, on instruction from the Engineer, the cost of such rectification of title deeds of the effected properties. Payment will be made against the PC Sum provided in Bill Item 1.19.

2) Compensation and Acquisition of Land

The Contractor shall bear the costs of provision of any land he may require in respect of his own camps, offices, houses, temporary works, etc.

132 HOUSING ACCOMMODATION FOR THE ENGINEER AND HIS STAFF, OFFICES AND LABORATORIES FOR THE ENGINEER WITH LABORATORY AND SURVEY EQUIPMENT AND FURNITURE

1) Site Accommodation for the Engineer and his Staff

The Contractor shall provide, maintain and furnish for the duration of the Contract rented accommodation for the Engineer. A description of the different types of accommodation required is given below.

On Completion of the Contract tenancy or ownership of the Engineer's staff houses, their furniture, equipment and services and the land on which they are constructed shall revert to the owners or Employer as the case may be.

The ownership of the Engineer's offices and laboratory but excluding the furniture and equipment purchased under Clause 141(f) of the Standard Specification shall revert to the Contractor.

(a) General

Rented accommodation shall consist of one or more combinations of five types of new houses. The houses shall have stone, timber or concrete block external walls. All materials shall be new, strong, durable and weather and termite proof with walls, ceilings, windows, doors and floors adequately insulated against heat and cold, mosquito and burglar proofed and painted inside and out with two coats of paint approved by the Engineer. Staff houses Types IV and V need not be constructed in permanent materials but must be of an acceptable standard and approved by the Engineer. New furniture to the approval of the Engineer shall be provided to the scales indicated in Appendix A to this Section of the Special Specification.

(b) Engineer's staff housing - Types I and II

The Contractor shall provide 1 No. Type I and 5 No. Type II staff houses which shall be of permanent construction and shall be 4 bedroomed or 3 bedroomed with minimum net floor areas of $120m^2$ or $100m^2$ respectively.

The Type I and Type II houses shall either be located in or near the Ngong Road or adjacent to the Contractor's camp as directed by the Engineer.

Each house shall be situated on a separate adequately drained plot of at least $2000m^2$. A chain-link dog-proof fence with lockable gate shall be provided around each house plot.

Driveways to the houses shall be at least 3m wide with turning/parking areas shall be provided adjacent to each house.

The houses shall be provided with a potable water supply, cold water storage tank, kitchen sink, washhand basins, baths with shower attachments, shower and waterborne sewerage system. The plumbing shall be arranged so that hot and cold water supply is available at the kitchen sink, washhand basins, baths and showers. Standpipes with lockable taps shall be provided outside every house.

The houses shall be wired for mains electricity and connected to a mains power supply or, if not available, to a generating plant of approved type located to the satisfaction of the Engineer.

The Contractor shall be responsible for rubbish disposal by providing outside bins and a daily collection service to a central disposal areas which will not cause a nuisance. Staff houses shall be equipped and furnished by the Contractor with new furniture and equipment in accordance to the scales given in Appendix A to this Specification and in qualities to the approval of the Engineer.

Housing accommodation for the Engineer's domestic servants shall be Type V and located adjacent to but detached from the site of the Types I and II staff housing.

Either instead of, or in addition to, renting new Type I and II houses for the Engineer, the Contractor may be required to arrange for the refurbishment of suitable existing houses close to the project.

(c) Engineer's staff housing - Types III and IV

The Contractor shall also provide 3 No.Type III and 5 No.Type IV staff houses.

Each house shall be provided with a potable water supply and waterborne sewerage system and shall be furnished and equipped with new furniture and equipment in accordance with the scales given in Appendix A to this Specification.

The Type III and IV staff housing may be adjacent to, but detached from, the housing accommodation provided by the Contractor for his own employee's. Housing accommodation for the Engineer's domestic servants shall be located adjacent to but detached from the site of the Engineer's staff housing Types I and II.

The houses shall be wired for mains electricity and connected to a mains power supply or, if not available, to a generating plant of approved type located to the satisfaction of the Engineer.

The Contractor shall be responsible for rubbish disposal by providing outside bins and a daily collection service to a central disposal area which not cause a nuisance.

2) Engineer's office

The Contractor shall provide, erect and maintain for the duration of the Contract an office for the Engineer of weather-proof construction, with windows, and suitably insulated against heat and cold, all to the satisfaction of the Engineer in respect of the condition, design and siting. The office shall have a net floor area of 137m^2 comprising 135m^2 of enclosed floor space and 52m^2 of verandah partitioned as directed by the Engineer, each with a clear inside height of 2.7 m. The floor stall be of steel floated concrete adequately damp and termite proofed.

The office of the Engineer shall be completely separate from that of the Contractor. The plot shall be not less than 2500m^2 in area and shall be fenced with a 2m high barbed wire fence and gate, with padlock and chain.

A telephone and/or radio call shall be provided in the office of the Engineer for the exclusive use of the Engineer's Representative, and the offices shall be provided with electric lighting and wall sockets all to the satisfaction of the Engineer.

A potable water supply shall be provided and all latrines shall have waterborne sewage disposal. A standpipe with lockable tap shall be provided outside the latrine with an external exit.

The Contractor shall provide an access road at least 6m wide to the Engineer's office and a 250m^2 car parking area. The road and car parking shall be surfaced with a minimum of 150 mm consolidated thickness of gravel or crushed stone. In addition the Contractor shall provide car ports to accommodate four of the Engineer's vehicles and which shall be located as directed by the Engineer.

Should, the Contractor during the course of the Contract, construct a temporary camp or office on a further site or sites then the Contractor shall also construct similar facilities for the Engineer's staff adjacent to such further site or sites as directed by the Engineer.

All costs of temporary facilities for the Engineer's staff shall be at the Contractor's expense.

3) Engineer's laboratory

The Contractor shall provide, erect and maintain for the duration of the Contract a laboratory adjacent to the Engineer's office. The laboratory shall be of similar construction to the office. A drawing of the requirements of the Engineer's laboratory is included in the Drawings.

The working area floor shall have a strengthened section incorporated consisting of a 1.6 m x 1.5m x 450 mm mass concrete plinth. A separate sample store of at least 20m^2 floor area shall be provided with shelves along one wall.

The laboratory shall be provided with 24 hour electric lighting and power points to the satisfaction of the Engineer. The permanent fixtures in the laboratory shall include 2 no. double draining board stainless steel sinks, piped drinkable water supply to each and waste water outlets. Work benches, comprising a working surface and one full length and width shelf under, of seasoned timber 1 m wide and 0.9m high and of a total length of approximately 15m shall be provided. Concrete plinths suitable for mounting the cube crusher and CBR load frame shall also be provided.

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

4) Furniture and Office Equipment for the Engineer's Office

Appendix B of the Specification details items which will be required to furnish and equip the Engineer's office and laboratory with furniture and office equipment. All such items shall be new and of approved manufacture and quality. On completion of the Contract all furniture and equipment which has been supplied shall revert to the Employer. The quantities of the items specified are provisional.

5) Equipment for the Engineer's Laboratory and Survey Equipment

Appendices C and D of the Specification details items of survey and laboratory equipment which will be required for use by the Engineer. All such items shall be new and of approved manufacture and quality. On completion of the Contract all survey and laboratory equipment which has been supplied shall revert to the Employer. The quantities of the items specified are provisional.

133 TIME FOR COMPLETION OF HOUSES, OFFICES, ETC.

The Contractor's attention is drawn to Clause 133 of the Standard Specification which requires houses, offices and laboratories to be handed over not later than 60 days after the Engineer's order to commence work and states that the Contractor is responsible for the cost of any temporary arrangements for accommodation, transport, etc., should he fail to complete within this period.

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 will be instructed to pay the cost of temporary accommodation, and transport for the Engineer's staff. Reimbursement of these costs will be made under Bill Items 1.01 and 1.06.

134 INSURANCE AND OWNERSHIP OF THE ENGINEER'S SITE ACCOMMODATION, OFFICES, LABORATORIES, FURNITURE AND EQUIPMENT

Delete in the first paragraph of Standard Specification Clause 134, second and third line the words "staff houses (Senior and Junior)".

137 ATTENDANCE UPON THE ENGINEER AND HIS STAFF

In the Engineer's offices and laboratories the Contractor shall provide soap, towel's, toilet paper, electric kettle, single plate gas burner and gas, 20 cups with saucers, bowl, jug, saucepan, 10 teaspoons, 20 litre water filter and cleaning equipment and shall keep the offices and laboratories in a well maintained, clean and habitable condition. Consumable items shall be replenished as required by the Engineer, and the equipment shall be repaired after breakage or loss as required by the Engineer.

The Contractor shall provide all tools, protective clothing, wooden pegs, iron pins and pickets, water, cement and aggregate for concreting and all assistance as may be required by the Engineer and his staff for setting out, measuring and checking the Works.

The Contractor shall provide, pay, including all overtime, and house the following staff for attendance upon the Engineer:-

2 No.- office attendants
9 No.- chairmen
10 No.- labourers

In addition to the above, the Contractor shall provide adequate security for the office, laboratory, advance laboratory, vehicles, and houses used by the Engineer and his staff. A minimum of two watchmen will be permanently employed at each site for office, laboratory advance laboratory and senior and junior staff houses.

No separate measurement or payment will be made for attendance upon the Engineer and his staff and the Contractor shall be deemed to have allowed elsewhere in his rates and prices for complying with the requirement of this Clause.

138 VEHICLES FOR THE ENGINEER

The following new vehicles shall be provided for the Engineer and shall revert to the Contractor at the end of the Contract.

(a)	1.8 litre 504 Peugeot Sedan (or similar)	1 No.
(b)	2.3 litre LWB 4WD Land Rover Station wagon (or similar)	3 No.
(c)	1.8 litre 4-wheel drive Subaru station wagon (or similar)	3 No.

140 PAYMENT OF OVERTIME FOR ENGINEER'S JUNIOR STAFF

Delete in the last line the words "shall be at the Contractors expense" and substitute with "including the approved percentage for administrative overheads shall be paid by the Contractor to the Engineers Representative".

If the Contractor wishes to execute permanent work outside the Engineer's normal working hours, as stated in Clause 108 of the Standard Specification, then the payment for the

overtime for the Engineer's Junior Staff shall be reimbursed in full, by the Contractor to the Engineer's Representative including the approved percentage for administrative overheads.

If the Contractor wishes to execute works on the regular basis outside the Engineer's normal working hours (Clause 108) over a prolonged period, the Engineer may, if he deems necessary, employ additional supervisory staff for which the required salaries, including the approved percentage for administrative overheads, shall be reimbursed in full by the Contractor shall to the Engineer's Representative and the Contractor shall provide the required adequate accommodation facilities for such staff at his own costs.

The Contractor shall not be reimbursed any of these costs.

SECTION 3 - SETTING OUT AND TOLERANCES

301 SETTING OUT

(a) Basic Survey

The basic survey available to the Contractor as reference material will include:

(i) a traverse line which is referenced by concrete columns with steel pins located alongside the works

(ii) a preliminary setting out of the geometric and road reserve markers which will enable the Contractor to check the lines and levels,

(iii) cross-sections at 20m intervals with design sections produced by CAD which if acceptable to the Contractor may be used for measurement and payment.

Any abortive setting out resulting from survey errors on the part of the Contractor, and any construction work carried out on the basis of such abortive setting out, shall be rectified entirely at the Contractor's expense.

(b) Detailed Setting Out

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

302 TOLERANCES

(a) Pavement Widths

The edges of the wearing course, base and sub-base shall nowhere lie closer to the carriageway centreline than the dimensions shown on or calculated from the design data given on the drawings or as amended by the Engineer in writing to the Contractor, and the half widths of wearing course, base and sub-base measured at any point along the road shall not exceed the nominal width by more than 50mm for wearing course, base and sub-base.

(b) Drainage

The maximum deviation from the specified horizontal line of a pipe culvert shall be 30mm in 3m and from the vertical line 30mm in 15m. The Contractor shall correct any excess deviation before proceeding with the work.

The invert level of drainage ditches both lined and unlined shall be within +0mm to -50mm of that specified by the Engineer and trimmed such that water does not pond. In the event of the Contractor over-excavating any lined or unlined drainage ditches or channels outside the specified tolerances, the Contractor will be held responsible for any additional work ordered by the Engineer as being, in his opinion, necessary to maintain acceptable invert grades. Such remedial work shall be carried out entirely at the Contractor's expense. Replacement of the over-excavated material within the ditches and channels will not be permitted, unless such material be compacted and that part of the channel be lined, all to the satisfaction of the Engineer. The Contractor should be aware that the most likely form of remedial work to be ordered by the Engineer for unlined ditches would be the deepening of the remainder of the ditch or channel downstream of the over-excavated section for such length as the Engineer deems necessary to avoid ponding, and, in his opinion, sufficient to adequately cope with the design flows.

SECTION 4 - SITE CLEARANCE AND TOPSOIL STRIPPING

401 SITE CLEARANCE IN FORESTED AREAS

Site clearance shall be deemed to be in forested areas (Bill Item 402) between the following chainages:

Ngong Forest	CH 9 + 800 ~17 + 800
Dagoretti Forest	CH 21 + 000 ~22 + 200

Strict compliance with Clause 401(c) of the Standard Specification is required. It is also important that site clearance shall not extend beyond the right of way.

402 REMOVAL OF TOPSOIL

Topsoil shall include all unsuitable material other than black cotton soil and rubbish as provided for in Special Specification Clause 501 to a depth not exceeding 200 mm encountered in the formation of side drains, drainage channels, accesses or in the road alignment. If such material is less than 200 mm deep the amount of topsoil shall be calculated by taking levels at topsoil locations before and after stripping.

Should the Engineer instruct that a greater depth than 200 mm be removed or that any unsuitable material requires disposal, payment for the additional material shall be made under the item for cut to spoil in the Bill of Quantities.

The Contractor shall ensure that topsoil stockpiles are constructed and protected in such a way as to prevent erosion.

Topsoil other than unsuitable material as defined in Special Specification Clause 501 shall be set aside for planting of trees and shrubs, and for planting protection of embankments as provided in Special Specification Clause 514 Topsoil not required for further use shall be placed neatly in spoil heaps adjacent to the road alignment as directed by the Engineer.

404 MEASUREMENT AND PAYMENT FOR BILL ITEM 4.04

a) Item : Scarify and remove to Stockpile existing pavement materials
Unit : m3

Excavation of existing pavement materials shall be measured by the cubic metre of material instructed to be excavated by the Engineer. The method of computation of the volume shall be in accordance with Clause 517 of the Standard Specification.

The rate for excavation of existing pavement materials shall be extra over items (a) or (c) of Clause 517 of the Standard Specification and shall include for all extra costs associated with excavating the material and either spoiling the excavated material or using the excavated material as fill as directed by the Engineer.

406 EXISTING PAVEMENT MATERIALS

At the major road junctions where existing road coincide with the alignment of new sections of Approach Road the Engineer may instruct the Contractor to excavate the existing pavement materials and either spoil them or use them as fill all in accordance with Section 5 of the Standard Specification.

407 DEMOLITION OF RAILWAY BRIDGE AT CH 27 + 000

The Contractor shall dismantle the Railway Bridge at CH 27 + 000 after the railway line has been relocated in coordination with the Kenya Railways Corporation. The deck slab and abutments shall be demolished and disposed of as directed by the Engineer, and the bridge girders handed over to the Kenya Railways for removal. The Kenya Railways Corporation will remove the track after relocation. Disposal of the embankments and ballast shall be treated as earthworks in accordance with Section 5 of the Specification.

Attention is drawn to Clause 82 of the Conditions of Contract Part 2 - Special Requirements in relation to Kenya Railways Corporation Work in the vicinity of Railway Tracks.

SECTION 5 - EARTHWORKS

501 SUITABLE AND UNSUITABLE MATERIAL

Material with high swelling characteristics or high organic content and any other undesirable material shall not be used, unless specifically directed by the Engineer. Unsuitable material shall include:-

- All material containing more than 5% by weight of organic matter (such as topsoil, material from swamps, peat, logs, stumps and perishable material).
- All material with a swell of more than 2.5% (such as black cotton soil).
- All clay of Liquid Limit exceeding 80 or Plasticity Index exceeding 50.

Only material approved by the Engineer shall be used for construction of embankment fills.

Spoil in unsuitable material (Bill Item 508) includes removal to spoil of black cotton soil and rubbish from the following Chainages, and from any other locations that the Engineer may classify as having black cotton soil:

Item	Section	Approximate Quantity (m^3)
Black Cotton Soil	CH 0 + 000 ~ 5 + 600	152,500
Black Cotton Soil	CH 11 + 000 ~ 11 + 280	4,500
Black Cotton Soil	CH 11 + 420 ~ 11 + 640	2,500
Black Cotton Soil	CH 11 + 800 ~ 12 + 200	8,600
Black Cotton Soil	CH 12 + 760 ~ 13 + 050	1,100
Black Cotton Soil	CH 13 + 740	200
Black Cotton Soil	CH 16 + 240 ~ 16 + 980	10,300
Rubbish	CH 8 + 850 ~ 9 + 030	9,800
Total		189,500

The above materials shall be spoiled as follows:

- Black cotton soil located from CH 0 + 000 to CH 5 + 600, shall be spoiled neatly inside the loops at Mombasa Road Junction and at side of the road within the road reserve limits.

- Black cotton soil located from CH 11 + 000 to CH 11 + 280, and elsewhere shall be spoiled neatly beside the road alignment as directed by the Engineer.

- Rubbish material located from CH 8 + 850 to CH 9 + 030 shall be spoiled inside the loops at Mombasa Road Junction.

Spoil heaps of black cotton and rubbish material shall be neatly landscaped, top soiled and grassed in accordance with Specification Clause 524 and as directed by the Engineer.

503 FILL FROM DRAINAGE POND EXCAVATION (BILL ITEM 5.03)

Fill from excavation of the Drainage Pond at CH 24 + 380 shall be used in adjacent embankment construction.

504 PREPARATION PRIOR TO FORMING EMBANKMENTS

The existing ground under embankments including the material left on the existing road after removal of the pavement shall be compacted in accordance with Clause 504 of the Standard Specification.

Measurement and payment of compaction of existing ground shall be in accordance with Clause 517(f) of the Standard Specification.

506 EXCAVATION IN SWAMPS

The following small areas will be classified as swamps:

CH 0 + 480 - a small shallow peat deposit
CH 5 + 300 - a small shallow peat deposit
CH 26 + 320 - edge of Ondiri Swamp with saturated peat deposit believed to be up to 1.5m thick over-lying rock

In accordance with Clause 506 of the Standard Specification all areas other than those specified above shall be considered as normal earthworks and the Contractor's rates shall include for all the requirements of Clause 116 of the Standard Specification.

Where directed by the Engineer the Contractor shall excavate and spoil the swampy material below the embankment to a maximum depth of 4.0m.

On completion of excavation the bed shall be prepared to receive a backfill of rockfill. The rockfill shall be compacted, measured and paid for in accordance with Clauses 507 and 517(j) of the Standard Specification. In general, and unless otherwise directed, the rockfill shall be laid on a filter fabric which shall extend for at least the full width and depth of the rockfill. The filter fabric shall be measured and paid for in accordance with Clause 517(k) of the Standard Specification. The depth of rockfill when required by the Engineer will vary from a minimum of 0.5m and a maximum of 1.5m.

Following the Engineer's approval the remainder of the excavation shall be backfilled as part of the normal earthwork operations and the Contractor shall ensure that this is carried out in the dry in accordance with Clause 116 of he Standard Specification.

514 TOPSOILING AND GRASSING

Planting of fill slopes and cut slopes (Bill Item 5.24) and central reserves (Bill Item 20.10) is required to control erosion. The Contractor may use approved indigenous or locally established 'runner' type grass such as Cynodon or "star grass" species for vegetation work and unpalatable but not poisonous plants. The Kenya Horticultural Society, Nairobi District, P.O. Box 40027, Nairobi and the Nairobi City Commission can provide appropriate guidance. The planting plan, however, must be approved by the Engineer.

Areas to be grassed shall be trimmed to a smooth profile and the soil surface raked to ensure a loose tilth to a depth of 50mm unless directed otherwise by the Engineer. The Contractor shall ensure that all plantings are adequately watered and that newly planted vegetation is protected from damage by grazing animals and from theft.

Planting shall be done just prior to the rains and be kept watered until the onset of the rains. The planting material shall consist of grass cuttings, dug from an existing lawn or nursery. The grass is separated from the soil and trimmed to a cutting of about 150 mm. The cutting must consist of a piece of rhizome or stem with or without roots showing. Seed cannot be used in Kenya generally because the rains are too unpredictable, and too heavy when they arrive.When planting, the cutting shall be inserted into the ground with 2/3 underground and 1/3 showing taking care to plant the correct way up. On sloping areas for quick covering, planting at shall be at 200 mm centres.

The ground shall be watered daily for the first week after planting unless sufficient rain has fallen. Signs of growth should appear after about 2 weeks, failing which planting shall be repeated.

During the rains an application of nitrogen fertiliser shall be applied by broadcasting granular C.A.N.

517 MEASUREMENT AND PAYMENT

a) Item : Earthworks Generally
Unit : m^3

Measurement unit be based on cross-sections taken generally at 20 m intervals. In irregular ground or tight curvature the Engineer may order ground cross-sections to be taken at closer intervals.

b) Item : Topsoiling and Grassing
Unit : m^2

Payment shall cover all costs associated with loading, and hauling topsoil from stock piles set aside for the purpose during site clearance operations, laying to a depth not less that 0.25m thick to lines and levels, lightly compacting, watering, fertilising, planting, establishing and maintaining a sward, and replanting as necessary until a satisfactory sward has been established.

520 ROCK FORMATION LEVELLING IN CUT

Rock formation in cut shall be trimmed in such a way that it shall at no point be higher than the formation level shown on the drawings for laying of the lean concrete base course. It shall then be levelled by use of approved sub-base material compacted to 95% MDD ASSHTO T.99. Payment shall be by the square metre of surface so treated under Bill Item 4.20.

526 FILL FOR NEW NATIONAL PARK BOUNDARY DIKE

Fill for construction of the new National Park Boundary Dike (Bill Item 526) between CH 0+ 800 and CH 4 + 960 shall be obtained from demolition of the existing dike. The standard cross-section for the dyke and its longitudinal profile will be agreed between the Contractor and the Engineer before commencement of work and after approval by the Kenya Wildlife service in accordance with Clause 121. The amount of fill to be paid for under Bill Item 5.26 will be measured after completion.

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

601 GENERAL

(i) Quarries :

Attention is drawn to Clause 601 of the Standard Specification and to discussion of possible quarry sites in the Materials report. However, the Contractor shall be entirely responsible for locating and developing suitable sources of material for filling of gabions and mattresses (Clause 711), pitching stone and building stone (Clause 828), graded crushed stone for base and sub-base (Clause 1302), aggregates for lean concrete (Clause 14A/03), bituminous surface treatments and asphalt concrete (Clauses 1504C and 1602B), and for all concrete works.

In the Komorock area there are extensive quarries of Nairobi phonolite being operated by thirteen or more commercial operators. These all produce aggregates in size separations which are blended to order. Only jaw crushers are used and particle shapes generally fall outside specification for Lean Concrete.

The Komorock quarry operators are all under orders to move to a new quarry location and it is not known how much longer they will be able to operate in their present positions. Accordingly Kitengela was investigated as a possible source of crushed stone for the Project.

The Kitengela quarry site is located next to the E.A. Cement Corporation near the Athi River. The site is on government land though squatters claim certain rights which world have to be investigated. 6 km further from Site is a large commercial quarry known as BMT which may also be investigated.

(ii) Borrowpits:

Attention is drawn to the Mass Haul Diagram included in the Tender Drawings. The Contractor may use side-borrow from cuttings where agreed by the Engineer.

(iii) Stockpile and Spoil Areas:

Notwithstanding any indications to the contrary in the Standard Specification, the Engineer will not make available to the Contractor any additional land for stockpiles and spoil areas.

Similarly, the contractor will be responsible for the provision and costs involved in proving 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 utilise these subject to the approval by the Engineer.

Attention is drawn to the intention that certain "black cotton soils" and rubbish removed as unsuitable shall be spoiled, landscaped, and protected with grass and shrubs within the area enclosed by the slip roads at the Mombasa Junction Interchange as provided in Special Specification Clause 2010. Hard materials produced by braking up and removal of metalled surfaces may also be placed and compacted below embankments as provided in Special Specification Clause 406.

(iv) Suitability and Quality of Materials

The Contractor's attention is drawn to the fact that the Employer cannot vouch for the suitability as regards the quality of the materials in the designated quarries and the Contractor is required to ascertain for himself the suitability and quality of the same.

No additional payment will be made to the Contractor to cover costs arising from this Clause and the Contractor must include such costs in the rates inserted in the Bill of Quantities.

605 SAFETY AND PUBLIC HEALTH REQUIREMENTS

(f) A tight control shall be kept on the discharge of 'operational' pollutants (suspended sediments, solutes, oils etc) into the groundwater and surface drainage systems.

(g) Following completion of the Works the Contractor shall reinstate all working areas in such a manner that land drainage is returned to its original form with stable vegetated slopes and does not represent a hazard to the public or livestock.

607 SITE CLEARANCE AND REMOVAL OF TOPSOIL AND OVERBURDEN

Notwithstanding the provisions of Clause 607 of the Standard Specification the Employer may require a new quarry if opened to be retained as a working quarry. If so the Contractor is to leave the site in a safe, tidy and workmanlike condition to the satisfaction of the Engineer.

SECTION 7 - EXCAVATION AND FILLING FOR STRUCTURES

703 EXCAVATION FOR STRUCTURES

Unless otherwise instructed by the Engineer, all excavated surfaces in material other than rock, on which foundations for structures are to be placed, shall be compacted to 105% MDD (ASSHTO T.99) immediately before foundations are constructed.

707 BACKFILLING FOR STRUCTURES

Unless otherwise instructed by the Engineer, all backfilling shall be compacted to a minimum dry density of 105% MDD (ASSHTO T.99).

Any porous drainage layer to be installed behind structures shall comply with the requirements of Clause 814 of the Standard Specification.

Granular fill where required by the drawings shall be similar to selected backfill material as specified in Standard Specification Clause 812.

711 WIRE GABION BOXES AND MATTRESS

(i) General Description

The gabions and mattresses shall be flexible galvanised gabions of the sizes as stated in the Bill of Quantities and drawings, fabricated of wire mesh of the type and size and selvedged as specified below. Each gabion box shall be divided by diaphragms into cells whose length shall not be greater than the width of the box and in the case of gabion mattress diaphragms shall be at 1.0 m centres. The gabions are to be of a single unit construction - the base, ends and sides either to be woven into a single unit or an edge of these members connected to the base section of the gabion in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh.

(ii) Steel Wire

See Standard Specification Clause 711.

(iii) Galvanising

See Standard Specification Clause 711.

The adhesion of the zinc coating to the wire should be such that when the wire is wrapped six times round a mandrel of 4 times the diameter of the wire, it should not flake or crack to such an extent that any zinc can be removed by rubbing with the bare fingers.

(iv) Mesh

The mesh shall be hexagonally woven mesh wherein the joints are formed by twisting each pair of wires through two full turns to resist raveling. Non-raveling is defined as the ability to resist pulling apart at any of the turns forming the mesh when a single wire strand in a section is cut.

(v) Selvedges

All edges of the gabions and mattresses, diaphragms and panels shall be selvedged with a wire of diameter not less than 20% greater than that of the mesh wire. The selvedging must be such that the mesh will not unravel and such that the strength of the connection between the

selvedged wire and the mesh should be equal to or greater than the breaking strength of the mesh.

(vi) Binding and Connecting Wire

Sufficient binding and connecting wire must be supplied with the gabions and mattresses to perform all the wiring operations to be carried out in the construction work. The diameter of the wire should be 2.2 mm diameter and should meet the same specification as for the wire used in the mesh.

(vii) Tolerances

a) Wire: A tolerance on the diameter of all wire of ±2.5% shall be permitted (in accordance with BS 1052-42). The tolerance on the weight of the gabions and mattresses is then subject to ±5%.

b) Mesh: A tolerance of ±15% on the nominal size of the mesh shall be permitted.

c) Gabion Boxes and Mattress: A tolerance of ±5% on the width and the height of the gabion box and mattresses and a tolerance of ±3% on the length shall be permitted.

(viii) Concrete blinding to Wire Gabions

Where instructed by the Engineer or shown on the Drawings gabions shall be blinded with a minimum of 50mm of Class 15/40 concrete. The gabion works shall be thoroughly wetted and concrete Class 6/40 then rammed into the interstices and smoothed off to give a minimum cover of 25 mm to the gabion mesh. The concrete blinding shall then be cured in accordance with Clause 1710 of the Standard Specification.

712 TRIAL PITS IN FOUNDATIONS TO STRUCTURES

Before commencing excavation for the foundation of any structure, the Contractor shall open up one or more trial pits within the areas of the foundation as directed by the Engineer's representative before excavating for the foundation. Where a trial pit is excavated to a level below the founding level of the structure, it shall be backfilled to that level with approved material or concrete as directed by the Engineer's Representative.

713 MEASUREMENT AND PAYMENT

Payment for excavation and backfilling or concreting of trial pits shall be made under the appropriate dayworks items in the Bill of Quantities.

SECTION 8 - CULVERTS AND DRAINAGE WORKS

801 SCOPE OF SECTION

Concrete box culverts as road culverts, drainage culverts, and pedestrian culverts are covered in Section 7 and 17 of the Standard and Special Specifications.

804 EXCAVATION FOR CULVERTS AND DRAINAGE WORKS

Excavation of trenches for pipe culverts, headwalls, wingwalls, aprons and toewalls, shall be measured below existing ground level or road formation level, whichever is the lower.

The top 150mm of excavation below the drain invert shall be compacted to a dry density of 100% MDD (AASHTO T.99).

809 BEDDING AND LAYING OF PIPE CULVERTS

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

812 BACKFILL

All backfilling of drainage works shall be to 100% MDD (AASHTO T. 99).

814 SUBSOIL DRAINS

Filling to subsoil drains shall comprise 40mm particle size single size clean crushed rock. Measurement and payment shall be in accordance with Clause 820 (h) of the Standard Specification.

815 PROTECTION WORK

Unless otherwise directed by the Engineer, the Contractor shall not remove cobbles and boulders from stream beds for masonry/gabion work.

Whenever possible, all drainage from area drains, side drains and culverts shall be discharged into existing gullies to minimise erosion.

In addition to stone pitching, gabions or rip-rap specified in Section 7, the Engineer may require the Contractor to protect waterways and turnouts from erosion by grass planting as specified in Section 5.

820 MEASUREMENT AND PAYMENT

In Clause 820 of the Standard Specification, add new sub-clauses 820(r), (s), (t) (u), (v), (w), (y) as follows:

(r) Item: Stone Pitching

Stone pitching for drainage works shall be measured and paid for as per sub-clauses 713(g) and (h).

(s) Item: Concrete Kerb Inlet
Unit: No.

Concrete Kerb Inlets shall be measured and paid for by number. The rate for each No. shall include for excavation in any previously constructed pavement layer, spoil, formwork provision of materials, placing of concrete kerb inlet, whether precast or made insitu inclusive of concrete bed and haunch.

(t) Item: Concrete Outfall Channel (Gutter)
Unit: m

The concrete outfall channel shall be paid for by linear metre of channel constructed, rounded to 1/10 of a metre inclusive of the cover. The rate shall include for excavation in any pavement material, formwork provision of all materials, constructing the channel and over.

(u) Item: Gulley Pots
Unit: No.

Gulley pots shall be measured by number specified. The rates for gulley pots shall include for excavation to any depth, removal of surplus material, provision of gulley pot complete with grating and frame, making connections to main drain, concrete surround, accurately setting frames to line and level and complying with the requirements of the Special Specifications.

(v) Item: Gulley Connections
Unit: m

Gulley connections shall be measured by the linear metre. The rate shall include for the cost of setting out, excavating to line, level, disposal of surplus excavated material, backfill, provision, laying and jointing of the pipes including pipe connections, Class 15(20) concrete haunch: and complying with the requirements of Clause 826 of the Special Specification.

(w) Item: Invert Block Drains
Unit: m

Invert block drains shall be measured by the linear metre. The rate shall include for excavation and trimming to line and level, setting out, backfilling with 100 mm thickness compacted approved gravel material, disposal of surplus spoil, providing laying and jointing invert blocks including all the necessary in-situ connections in concrete of the class specified and as detailed on the drawings.

(x) Item: P.C.C. Side Slabs
Unit: m^2

Side slabs to invert block drains (I.B.D.) shall be measured by the square metre. The rate shall include for excavation and trimming of the side slopes, disposal of surplus material, backfilling with 100mm thickness compacted approved gravel material, providing laying and jointing side slabs to the invert block drain including all the necessary in-situ connections in concrete of class 15(20) and as shown on the drawings.

(y) Item: Concrete Outfall Channel
Unit: m

The rate shall include for preparing and compacting the ground as specified, placing Class 20 concrete for 250 x 150 mm in in-situ gutters and providing and placing the reinforcement.

821 GULLEY POTS

Gullies complete with gratings and frames shall be supplied and laid in accordance with the drawings, or as directed by the Engineer.

At locations directed by the Engineer the gullies shall be provided with a 150 mm thick concrete Class 15(20) bed, and surround instead of the normal 100 mm bed and surround. The concrete surround shall be brought up to the underside of the frame or be flush with the top surface as appropriate for the placing of any asphaltic pavement layer.

822 GULLEY CONNECTIONS

Connections from gullies to surface water drains or ditches shall consist of concrete pipes and fittings as shown on the drawings. All pipes, bends and junctions shall be laid to the lines and levels shown on the Drawings or as directed by the Engineer.

Backfilling of over excavation for the pipe trench shall not be allowed. Any over excavation shall be made good by placing additional concrete of the quality specified for the pipe surround, at the Contractor's cost.

823 KERB INLET AND OUTFALL CHANNEL AT BUS-BAYS

Any excavation made for the kerb inlet and outfall channel beyond the lines shown on the drawing, shall be made good with a concrete of the quality as to be used for the adjoining works at the Contractor's cost.

The surface finish to exposed concrete surfaces shall be to class F3 finish. The surface finish to the top of the cover shall be to F1 finish.

824 INVERT BLOCK DRAINS AND SIDE SLABS

Precast concrete invert block drains and side slabs shall be formed of concrete of the class specified and to the dimensions shown on the Drawings. Drains shall not normally be laid to a radius of curvature less than 10 times the bed width or diameter or the drain.

Invert block drains shall be constructed in the positions and to the levels and dimensions shown on the Drawings or as directed by the Engineer. The earth sides to such channels shall be neatly finished to a slope of 1:1 or such other slope as the Engineer may direct. Invert block drains and side slabs shall be laid on 100 mm thick compacted approved gravel material, and neatly jointed with mortar consisting of 1:3 cement; sand by volume.

826 CONCRETE OUTFALL CHANNEL

The concrete outfall channel shall be constructed to the slope and dimensions as shown on the drawing. The section of the channel where the concrete is to be placed the ground shall be compacted to 95% MDD AASHTO T.99. The concrete shall be Class 15(40). The nominal reinforcement shall be chainlink mesh wire of 12 SWG. Two different types of concrete outfall channels are billed. (Type III and VII).

828 STONE PITCHING

All pitching stone shall, when soaked, be capable of withstanding a crushing stress of 20N/Sq.mm. The source of the stone shall be free from overburden, mudstone, cracks, sandholes, veins, laminations or other imperfections.

830 CEMENT RENDERING ON BUILDING STONE

Where building stone is used in the concrete channel with cascade in place of stone pitching the joints will be grouted with 1:4 cement:sand mortar well rammed into the wetted interstices and smoothed off flush with the face of the structure with cement rendering.

831 GABIONS AND MATTRESSES

See Special Specification Clause 711.

834 FILTER FABRIC

Filter fabric will be a standard grade of "Terram" fabric or similar to the approval of the Engineer.

842 GRANULAR FILL

Granular fill where required by the drawings shall be similar to selected backfill material as specified in Standard Specification Clause 812.

843 PLANTING ON CHANNEL SLOPES

Channel slopes shall be planted with grass to control erosion in accordance with Special Specification Clause 2021.

844 EARTH DIKE OF DRAINAGE POND

The earth dike of the drainage pond shall be constructed of suitable fill material compacted to 95% MDD ASSHTO T.99.and to the lines and levels shown on the drawings.

Grassing will be done in accordance with Clause 2010 of the Special Specification and paid for under Bill Item 843.

SECTION 9 - PASSAGE OF TRAFFIC

901 MAINTAINING THE PASSAGE OF TRAFFIC - GENERAL OBLIGATIONS

The Project crosses innumerable roads, tracks and rights of way by foot and vehicle. Some of these will be provided with permanent crossing facilities over the bypass, others will not.

(i) the scope of this section therefore covers all existing rights of way as evidenced by tracks and footpaths whether surfaced or not, until such time as they may have been closed by arrangement with the Employer.

(ii) requests for closure of existing traffic crossing points when necessitated for completion of the permanent works shall be made in writing to the Engineer's Representative at least four weeks prior to such closing being necessary and with a substantiating statement explaining the reasons for which closure is requested.

Where in the opinion of, or in agreement with, the Engineer, it is necessary to pass traffic through or across the Works in accordance with Clause 906 of the Standard Specification, any damage thereby caused to the Works, shall be made good at the Contractor's expense and to the satisfaction of the Engineer. The requirements of Section 14 of the Specification should be noted in regard to trafficking sub-base.

The Contractor shall provide, to the satisfaction of the Engineer, appropriate direction signs, barriers, "STOP/GO" boards and other equipments and personnel to assist the smooth and safe passage of public traffic through or across the Works.

Temporary reflective traffic signs shall be erected and properly maintained whenever public traffic is affected by the Works and the number, type and siting of these signs shall be as directed by the Engineer.

A traffic control plan for the direction and control of traffic must be prepared at a suitable scale at least two weeks prior to commencement of any works affecting traffic and this plan must meet with the approval of the Engineer. Modifications may be made to the traffic control plan as necessary but these must have the approval of the Engineer. The traffic control plan must take into account the relocation and updating of traffic signs as the work progresses.

All temporary traffic signs used must be recognised traffic signs specified in the Manual for Traffic Signs in Kenya, Parts I and II. Non-standard signs may be used with the approval of the Engineer. All signs must be tetro-reflective, of a type approved by the Engineer, kept clean and maintained in good condition.

All fences and barriers must be of type approved by the Engineer and must be maintained in good condition and kept clean. They must be painted with red and white stripes using reflective paint and shall be covered with reflective film or equipped with alternating red and white reflectors. Fences and barriers may be constructed of wood, metal, plastic, concrete or any other combination thereof and must be weather resistant.

Barriers, other hazards, entrances to detours and deviations shall be illuminated throughout the night by red lamps or amber flashing lights supported at a height of between 0.7 m and 1.35 m above the road, and maintained bright.

The Contractor must provide sufficient signs such that all deviations are fully signposted at all times throughout the Contract and make provision for replacing any lost or damaged immediately. This applies to all signs including red and amber flashing lights which must be operational at all times at night and must be constructed and placed in such a manner as to be vandal proof. The Contractor should allow for the provision of night watchman at such locations as entry and exit to deviations to ensure the proper and continuous operation of all such lights.

The Contractor shall allow for all the expenses of all the above general obligations in the rates tendered in the Bill of Quantities as they shall not be paid for separately. All these obligations shall be fulfilled to the satisfaction of the Engineer.

904 CONSTRUCTION AND MAINTENANCE OF DEVIATIONS

Construction of Deviations in accordance with Clause 904 of the Standard Specification will require employment of four different pavement types namely:

Type	Pavement Width	Construction
Type 1	7 metres	50 mm Asphalt Concrete 300 mm Graded Crushed Stone Base
Type 2	7 metres	Double Surface Dressing, Gravel Base
Type 3	6 metres	Gravel Construction 100mm compacted thickness
Type 4	3 metres	Gravel Construction 100mm compacted thickness

300mm below the structural components shall be compacted to 95% MDD (AASHTO T99) and four days soaking.

The location, length and types of these diversions will be as follows:

Location	Type 1	Type 2	Type 3	Type 4
Mombasa Road Junction - A104 Road	980m			
Likoni Road			450m	
Uhuru Monument Junction - Langata Road	265m			
CH 12 + 400 to 600 and 13 + 500 to 800			300m	
Ngong Road Junction - Approach Road		800m		
Dagoretti Forest Junction - Approach Road		500m		
Thogoto Junction Approach Road				1000m
CH 26 + 400 Service Road			120m	
Kikuyu Town & Kikuyu Junction				1500m
Total	1245m	1300m	870m	2500m

Reinstatement and maintenance of deviations shall be in accordance with Clauses 904(e) and 905 of the Standard Specification.

906 MAINTENANCE OF THE PROJECT ROAD USED FOR DEVIATIONS

The roads and lengths concerned are as follows:

Location	Bypass	Slip Road	Approach Road	Service Road
Uhuru Monument Junction			500m	
Ngong Road Junction			800m	
CH 15 + 980 ~ 16 + 400				665m
CH 17 + 800 ~ 20 + 600				2945m
Dagoretti Forest Junction			500m	
CH 22 + 200 ~ 23 + 200				1951m
Thogoto Junction			500m	
CH 23 + 600 ~ 23 + 900				440m
CH 24 + 800 ~ 25 + 500				820m
CH 26 + 400				50m
Kikuyu Town & Kikuyu Junction	1850m	3100m		
Total	1850m	3100m	2300m	6871m

907 SIGNS AND BARRIERS

Signs and barriers as per Section 9 of the Standard Specification and as directed by the Engineer shall be provided specifically for the following roads and deviations:

Location	Metres
Mombasa Road Junction - A104 Road	3670
Likoni Road	900
Uhuru Monument Junction - Langata Road	920
Ngong Road Junction - Approach Road	1600
CH 17 + 800 ~ 20 + 600 - Service Road	2945
Dagoretti Forest Junction - Approach Road	500
CH 22 + 200 ~ 23 + 200 - Service Road	1951
Thogoto Junction Approach Road	1000
CH 23 + 600 ~ 23 + 900 - Service Road	440
CH 24 + 800 ~ 25 + 500 - Service Road	820
CH 26 + 400 Service Road	240
Kikuyu Town & Kikuyu Junction	3940
Total	18926

908 REINSTATEMENT OF EXISTING ROADS AFTER CROSS-DRAINAGE WORKS

New cross-drainage culverts will be required across two existing roads which will have to be reinstated as follows:

Mombasa Junction - A-104 Road	70 sq.m.
Kikuyu Junction	35 sq.m.

Other existing roads and tracks will be required to be reinstated to their previous condition after construction of cross-drainage works.

909 IMPROVEMENT OF EXISTING ROADS

Improvements to existing roads and entrances will be required to connect them with project approach roads and service roads as directed by the Engineer. The equivalent specification requirements are as follows:

Sub-item	Specification
(1) Improvement to sub-grade	As Item 5.04
(2) Gravel wearing course	As Items 10.04 to 10.09
(3) Graded crushed stone	As Items 13.05 to 13.09
(4) MC3000 first seal coat	As Item 15.04C for single surface dressing but at nominal spray rate of 0.6 litres/m^2
(5) Chippings, 3/6mm	As Item 15.04C for single surface dressing at a rate of 189 m2/m3

910 LOCATIONS WHERE DEVIATIONS NOT POSSIBLE

There are two locations where deviations will not be possible:

CH 27 + 460 Railway Bridge
CH 27 + 940 Vehicle Bridge No.2

At these two sites the Contractor shall arrange passage for traffic to be provided through the Site during construction. The costs of so doing shall be deemed to have been spread amongst relevant items in Section 17 of the Bill of Quantities and no separate payment shall be made.

The above, notwithstanding, the Contractor shall submit his proposals for passage for traffic through these sites for the approval of the Engineer not less than four weeks before commencement of work on these bridges.

SECTION 10 - GRAVEL WEARING COURSE

1001 LOCATION OF THE MATERIAL SITE

The locations of several potential gravel pits are described in the Materials Report.

1003 MATERIAL REQUIREMENTS

Gravel Wearing Course shall comply with the following requirements of the Standard Specification:

Class:	2
Grading after compaction	0/40 mm
Plasticity Modulus	20 - 1,200
Plasticity Index:	5-20%
CBR	at 95% MDD (Modified AASTO) and 4 days soaking not < 20

1011 MEASUREMENT AND PAYMENT

Notwithstanding the provisions of this clause no separate payment shall be made for overhaul and all such costs are deemed to be included elsewhere.

SECTION 13 - GRADED CRUSHED STONE FOR SUB-BASE AND BASE

1302 SOURCES OF MATERIAL

The Contractor shall be responsible for locating and developing suitable sources of material for graded crushed stone in accordance with Clause 1302 of the Standard Specification.

1303 MATERIALS REQUIREMENT

Graded Crushed Stone for Sub-base and Base shall be Class B of 0/40 nominal size all as specified in Section 13 of the Standard Specification.

After compaction, the graded crushed stone pavement materials shall have a maximum of 8% of particles smaller than 0.075 mm.

The crushing ratio for all graded crushed stone pavement materials shall be 100%.

1306 - LAYING AND COMPACTING GRADED CRUSHED STONE SUB-BASE AND BASE

The graded crushed stone pavement materials shall be laid by a paver for the main and slip roads.

For the service roads the graded crushed stone may be laid by other plant capable of distributing the graded crushed stone in a uniform layer without any segregation.

1311 - MEASUREMENT AND PAYMENT

Item : Graded crushed stone sub-base and base materials
Unit : m^3 for class specified (B-0/40 nominal size)

Regardless of the source, the Contractor will be fully responsible for development and reinstatement of any quarries and access in accordance with Standard and Special Specification Section 6 and the rate shall be full inclusive of all operations necessary to supply the stone compacted in place on site.

No overhaul will be paid.

SECTION 14A - LEAN CONCRETE BASE

14A/01 LEAN CONCRETE GENERALLY

Lean concrete shall be laid to the thickness indicated to form part of the pavement. It shall be laid on the formation or sub-base as directed or as indicated to receive bituminous surfacing.

14A/03 MATERIALS REQUIREMENTS

The constituent materials of lean concrete shall generally comply with the relevant requirements of Section 17 of the Standard Specification, but

Cement shall comply with Kenya Standard KS02-21 in all respects.

Cement supplied in bags shall be batched by weight. Bulk cement shall be measured by weight. Where bags are proposed to be used, the amount of aggregate used in each batch shall be such as will only allow whole bags of cement to be used in each batch. No split or damaged bags of cement shall be used.

Aggregates shall be either:-
(i) 40 mm Nominal size graded coarse aggregate to the table in 14A/03(i)(a) of the Standard Specification, or
(ii) Reconstituted all-in aggregate complying with the grading referred to above.

Recent experience in Nairobi with similar materials indicates that the requirements of this specification may be obtained beneficially by using for fine aggregates a combination of sand and crushed rock fines (from the tertiary crushers only) wholly in place of sand.

14A/04 MIX REQUIREMENTS

(i) Proportions
Mix proportions generally: At the commencement of the Contract, the Contractor shall submit for approval to the Engineer sieve analyses of fine and coarse aggregates if applicable, together with the ratios of coarse to fine aggregates, cement to combined aggregates, and water/cement ratios, that is proposed for use in the mix. Any variations from the approved ratios may be only be made with the written permission of the Engineer.

Cement: The nominal ratio of cement to aggregate (including absorbed moisture but excluding free water) shall be 4% by weight to achieve coverage of all particles. The Engineer may require an adjustment to the cement content after site trials have determined the best compromise between obtaining coverage of particles by cement and a modulus appropriate to the pavement design.

Aggregates: Aggregates shall be batched by weight, due allowance being made for water content. The apparatus for weigh batching shall be approved by the Engineer. It shall be accurate within 2% and be checked for accuracy at least once a week.

Water Cement Ratio: The term water/cement ratio means the ratio by weight of water to cement in the mix, expressed as a decimal. The water is that which is free to combine with the cement in the mix, including free water in the aggregates, but not water absorbed by the aggregates.

When determining the moisture content of the aggregate for this purpose, the aggregate shall not be dried in an oven, but shall be surface-dried with absorbent cloth or similar material. The moisture content of the fine aggregate may be calculated in accordance with Part 2 BS812. It should be noted that aggregates produced from Nairobi phonolite are highly absorbent. Therefore, in calculation of water to be added to the mix allowance must be made for

absorption of the Nairobi phonolite aggregate as measured by ASTM Test Designation D2041 - 78.

The optimum water content for laying shall be determined by field tests as described below and shall be controlled within 1.0%. The optimum water content is that resulting in the maximum dry density and shall be determined by tests.

A series of laboratory test cubes shall be made from concrete having varying water contents ranging from 5% to 7% by weight of the dry materials, at least 3 cubes being made from each. The concrete shall be compacted in 3 separate layers by vibration which shall be applied until compaction to zero air voids is complete. The cubes shall then be cured for 7 days after which the mean dry density of each group shall be calculated. The proposed maximum and minimum cube strengths to comply with Subclause (ii) of this Clause shall be stated with the proposed mixes. The resultant water content should be the maximum amount that the mix can carry without free water in excess of a slight sheen appearing on the surface after rolling and without the roller tending to pick up material.

(ii) Crushing strength

Works test cubes shall be made, cured and tested in accordance with BS 1881. They shall be made in groups of 3 cubes under the supervision of the Engineer or his representative, each group being made from the same batch of concrete. The concrete shall be compacted in 3 separate layers by vibration which shall be applied until compaction to zero air voids is complete.

The frequency of making test cubes shall be two groups from each 1000 m^2 of concrete placed or at least two groups each full working day whichever is the more frequent.

The strength requirement in the early stages of construction shall be deemed to be satisfied if the crushing strength requirement at 7 days is achieved. As soon as possible, tests at 28 days shall be used.

In all cases, the results of both 7 day and 28 day works cubes tests shall be reported in writing to the Engineer within 24 hours, or, in the case of tests carried out before a weekend or Public Holiday, as soon as possible thereafter.

The average 28 day strengths of groups of three cubes determined in accordance with BS 1881 shall be such that not more than one in any consecutive five such averages is less than 10 N/mm^2 or more than 20 N/mm^2. If, however, the overall average of any consecutive five groups of three cubes (i.e. fifteen cube strengths) falls below 11N/mm^2 or exceeds 20.5 N/mm^2 at 28 days, or if the average range of five consecutive groups exceed 50% of the overall average strength of the fifteen cubes, the Engineer shall require the use of different materials or mix proportions.

The average 7 day strengths of groups of three cubes determined in accordance with BS 1881 should be not less than 7 N/mm^2 and not more than 14 N/mm^2, and if more than one of the 7 day average strengths of groups of three cubes in any consecutive five such averages are below 7 N/mm^2 or above 14 N/mm^2, the cement content shall be altered to such a value as may be approved 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 produced.

Monitoring of crushing strengths must be regarded as a proxy for monitoring of the modulus of elasticity for conformity with the pavement design. As a result changes in mix design may be required for adjustment of the modulus as determined by separate tests.

(iii) Density Tests

Densities shall be calculated as a routine part of the strength testing of cubes in accordance with BS 1881 from the dimensions and weights of cubes.

Field density tests shall be carried out in groups of three tests at intervals of 500 m^2 of the laid concrete or at least once a day, in accordance with B.S.1377 - Part 9, Clause 2.2 or 2.3.

Field densities may also be tested using a Nuclear Density Gauge generally in accordance with BS 1377 - Part 9, Clause 2.5 except for moisture content measurement which shall be undertaken in accordance with BS 1377 - Part 2. Calibration of the Nuclear Density Gauge by the method detailed in Clause 2.5.5.1 of BS 1377 - Part 9 shall be undertaken at weekly intervals. If the Engineer is satisfied with the precision of the Nuclear Density Gauge the frequency may be reduced to that specified in BS 1377 - Part 9. Wherever possible bulk density measurements shall be made using the direct transmission mode. The probe shall be inserted to the full depth of pavement construction where practicable.

The average density of each group shall be calculated. If more than one average density in five consecutive averages is less than 95% of the maximum obtainable cube density of material as compacted to zero air voids in the laboratory tests, or 96% of the target density established in Test BS 5835 whichever is the greater, the Engineer may order the removal of the area represented by the low density and its replacement with satisfactory material at the Contractor's expense.

14A/05 METHOD OF CONSTRUCTION

(i) Trials Areas

A trial areas of lean concrete, of the mix derived from laboratory tests with the optimum water content, shall be laid using the equipment to be used until approved by the Engineer. Each trial area shall be at least 15 m long, 6 m wide and 150 mm thick and shall be mixed, transported, laid, compacted and cured by the Contractor's selected method. The water content may be increased by not more than 1% if, in the opinion of the Engineer compaction can thereby be improved.

Two groups of three field density tests shall be carried out where directed in each trial area and the dry density determined in accordance with BS 1377, Part 9 Clauses 2.2, 2.3 or 2.5. The average dry density of each group of three density tests shall be not less than 95% of the maximum dry density as compacted to refusal in laboratory tests, failing which the Engineer may require additional trial areas to be laid with the mix and procedure modified within the limits of this Specification until he is satisfied that the mix and methods are satisfactory. Works test cubes shall also be taken, as described in Clause 1408, of the mixes used in trial areas.

Nevertheless, the Contractor is entirely responsible for ensuring that density and strength requirements in subsequent work comply with the works strength as herein specified.

(ii) Mixing, transporting and laying

Lean concrete shall be produced by the stationary plant method of construction. The concreting plant shall be suitable in type, capacity and design for its purpose and be in accordance with BS1305. The plant shall be to the approval of the Engineer. Such approval will in no way relieve the Contractor of his responsibility to maintain sufficient plant for the completion of the Contract.

Where the batching plant is of the type in which cement and aggregates are weighed in the same compartment, the cement shall be introduced into the compartment between two sizes of aggregate.

(iii) Laying and Compaction

Lean concrete shall be laid in continuous bays and compacted by one of the following methods:-

(i) by mechanical spreading between forms followed by rolling with a vibrating roller which applies a static mass per metre width of roll of over 1800 kg/roll followed by a smooth tyred roller;

(ii) by a mechanical spreading and compacting machine between forms followed as necessary by rolling with a vibrating or smooth tyred roller;

(iii) by a self-propelled slip form paving machine. In no circumstances shall the unsupported edge of the concrete be rolled following the machine. In the event of collapse of, or cracking adjacent to, the unsupported edge of the concrete, this shall be cut back to a vertical face.

Where side forms are used the width between such forms shall not exceed 6 m. Forms shall be placed to accommodate changes of slope. They shall be set to the final compacted surface levels of the lean concrete such that the uncompacted material will have to be spread to a pre-determined surcharge level above the forms.

Before laying lean concrete the graded crushed stone sub-base shall be thoroughly wetted and kept wetted to reduce absorption of water from the lean concrete.

Compaction shall be performed immediately there is sufficient length to enable the roller to operate and, in any case, be completed within two hours of the material being mixed. The roller shall be operated where required by the Engineer, both longitudinally and transversely. The first two passes shall be made without vibration to bed down material and subsequent rolling with vibration shall continue until the movement of the surface beneath the roller ceases and until the surface is closed. This shall be followed by rolling without vibration to further close the surface. Areas of the surface which do not satisfactorily close due to lack of fines or for any other reason shall be removed and replaced with the correctly graded materials before compaction of the surrounding areas is finished. At the end of each day's work or when placing of concrete is stopped for more than 1 hour, the material shall be feathered out and subsequently cut back to a straight vertical face showing the full specified thickness. Any joints between concrete layers shall be staggered by 1500 mm.

The minimum compaction thickness shall be 50 mm.

(v) Construction Joints

Construction joints shall be straight and vertical through the full thickness of the slab. The face of the concrete on one side of the joint shall be treated with a coat of cationic bitumen emulsion within 3 hours of forms being removed and before the adjacent bay or lane is laid.

(vi) Curing

Lean concrete shall be cured by protecting it against loss of moisture, rapid temperature change and mechanical injury for at least three days after placement.

After finishing operations have been completed, and within one hour of completion of compaction, the entire surface of the newly placed concrete shall be covered by a curing material approved by the Engineer. The edges shall be cured immediately, or in the case of side-form construction, immediately after form removal. The contractor shall have the equipment needed for adequate curing at hand and ready to install before actual placement begins.

The curing medium shall be a quick breaking 55% bitumen emulsion or bitumen emulsion such as Kl-60 to B.S.434: Part 1, spread evenly over the surface at a rate of 0.33 to 0.60 litre/m^2 in accordance with BS434: Part 2, and lightly blinded with sand to minimise solar heat absorption.

14A/06 TRAFFIC AND PROTECTION OF FRESH LEAN CONCRETE

Clause 1711 of the Standard Specification shall apply. No traffic shall be allowed on newly laid lean concrete for seven days or until such time as it is deemed by the Engineer to be hard enough to resist damage by such traffic.

14A/07 CONCRETE FINISH

The maximum acceptable departure from the specified level shall be plus 6 mm minus 20 mm.

For checking compliance measurements of the surface level shall be taken on a grid of points. The spacing of the grid shall normally be 10 m longitudinally and 5 m transversely.

In any length of pavement compliance shall be deemed to be met when not more than one of ten consecutive measurements taken longitudinally or one in any transverse line exceeds the tolerance permitted provided that this one measurement shall not exceed by more than 5 mm the tolerance permitted.

The surface finish shall be smooth with not more than 10 mm difference measured under a standard 3 m straight edge.

Where lean concrete is laid as a sub-base its regularity when tested in accordance with the procedure outlined in the foregoing paragraph shall be such that there is between the bottom of the straight edge and the concrete, no gap greater than 20 mm.

Where concrete fails to pass this test, it shall, at the Contractor's expense, be cut out and replaced, ground down or regulated with bituminous mixture to the satisfaction of the Engineer before placing the overlying construction.

14A/12 MEASUREMENT AND PAYMENT

(a) Items 14A/1-14A/4 : Lean Concrete for base or sub-base

Unit : m^3

Lean concrete shall be paid by the cubic metre calculated as the compacted sectional area instructed to be laid and the length instructed.

The rates for lean concrete for base or sub-base or shoulders shall include for the cost of providing, mixing, hauling, spreading, compacting, curing and protecting the material and complying with the requirements of Section 14A of the Standard Specification.

No overhaul will be paid.

SECTION 15 - BITUMINOUS SURFACE TREATMENTS AND SURFACE DRESSINGS

1501C GENERAL

The design provides for five different pavement structures (Types A, B, C, D, and E) of which one employs double surface dressing (Type C); and two shoulder surface treatments, one being double surface dressing as used in pavement structure Type C, and the other being a single surface dressing. Types A, B, D and E pavement structures require a prime coat immediately before application of the asphalt concrete binder and wearing courses and tack coats before laying successive layers of asphalt concrete.

The location of these surface treatments will be as follows:

Locations	Prime and Tack Coats	Double Surface Dressing	Single Surface Dressing
Main road	√		
Main road shoulders		√	
Slip roads	√		
Slip road shoulders		√	
Approach roads			
at Uhuru	√		
Monument	√		
at Kikuyu town			
Approach roads			
at Ngong road		√	
Dagorreti Forest		√	
Thogoto		√	
Approach road shoulders			√

1502B MATERIALS FOR PRIME AND TACK COATS

Prime Coat shall be medium-curing cut-back MC30 applied at a rate of 1.0 l/m^2.

Tack Coat shall be medium-curing cut-back MC3000 applied at a rate of 0.6 l/m^2.

1502C MATERIALS FOR SURFACE DRESSING

The binder shall be a medium curing cut-back such as MC3000. The chippings shall be comply with Standard Specification Clause 1502C. The materials requirements and application rates may be summarised as follows:

Item	Type	Application Rate
For Double Surface Dressing		
1st Seal coat - Binder	MC3000	1.3 l/m^2
- Chippings	10/14 mm	69 m^2/m^3
2nd Seal coat - Binder	MC3000	0.6 l/m^2
- Chippings	3/6 mm	250 m^2/m^3
For Single Surface Dressing		
Seal coat - Binder	MC3000	1.3 l/m^2
- Chippings	3/6 mm	189 m^2/m^3

1503C RATE OF APPLICATION OF PRIME AND TACK COATS

Application of prime and tack coats shall be in accordance with Clauses 1501B - 1507B of the Standard Specification.

SECTION 16 - BITUMINOUS MIX BINDER COURSES AND WEARING COURSES

1601B ASPHALT CONCRETE FOR SURFACING

1) General

Some significant causes of early aging and cracking, with associated high maintenance costs, of asphalt of road and airport pavements in Nairobi have only recently been diagnosed. These relate to the unusually high absorption of Nairobi phonolite aggregates and its effect on the hardening and oxidisation properties of bitumen. As yet there is no definitive or complete solution to the problem and this Specification is based on current best practice in Kenya, and the following basic strategy:

- bitumen from a preferred source and production method.
- aggregates to be limited to 3% max. absorption; sodium sulphate soundness 12% max; magnesium sulphate soundness 18% max.
- strict attention to temperature control and other measures to reduce oxidisation during mixing and laying.
- strict attention to quality control to ensure maximum attainable density of the wearing course to further inhibit oxidisation.

The most crucial element amongst the above is the quality of the aggregate which is highly variable and mostly outside the above specification. Careful selection of aggregate and conscientious supervision will therefore be required at all times, and ample time must be allowed for trial mixes, plant trials, and approval of a methods statement by the Engineer.

2) Asphalt Concrete Requirements

Two kinds of asphalt concrete shall be used:

- a binder course of asphalt concrete Type I (0/20 mm nominal aggregate size) (High Stability) with a nominal bitumen content of 5.5%, and

- a wearing course of asphalt concrete Type I (0/14 mm nominal aggregate size) (High Stability) with a nominal bitumen content of 6.5%.

The location and thicknesses of the binder and wearing courses shall be as follows:

Locations	40 mm Wearing 80 mm Binding	40 mm Wearing 60 mm Binding	40 mm Wearing 40 mm Binding	50 mm Wearing 110 mm Binding
Main road	√			
Slip roads				
at Mombasa Rd. Jn.	√			
at Uhuru Jn.		√		
at Ngong Rd Jn.		√		
at Dagoretti Jn.		√		
at Thogoto Jn.		√		
at Kikuyu Town Jn.		√	√	
at Kikuyu Junction	√			
Approach Road				
at Uhuru Junction				√

1602B MATERIALS FOR ASPHALT CONCRETE

(a) Penetration grade bitumen.

The binder for both asphalt concrete wearing course and for asphalt concrete binder course shall be 80/100 straight run penetration grade bitumen vacuum refined by the propane precipitation method from Venezuelan crude or equivalent.

(b) Aggregate

The coarse aggregate (retained on a 6.3 mm sieve) shall be crushed rock class b as defined by Clause 1602 (b) of the Standard Specification. It should be anticipated that achievement of the specified Flakiness Index with Nairobi phonolite will require use of an impact crusher.

For the wearing course the maximum value for water absorption shall be 3%

The fine aggregates (i.e. 100% passing the 3.5mm sieve and retained on 75 micron sieve) shall be approved sharp grained clan natural bank, river, dune or pit sand and crushed rock quarry fines produced in a secondary plant. They shall be free from loosely bonded aggregations and other foreign matter. Fine aggregates from each supply source shall be tested for water absorption in accordance with the methods described in BS 812, JIS A 1110, and ASTM Designation 2041-78, and if the value exceeds 3% the source shall be rejected.

The total combined fine aggregate content of the Wearing Course Mixture shall contain not less than 40% of approved quarry fines produced from crushed rock complying with the requirements of Clause 1602 (b) of the Standard Specification.

In the grading of the crushed rock quarry fines the percentage of the fraction passing 75 microns B.S. sieve shall not exceed 5 per cent.

All crushed rock quarry fines shall be washed unless otherwise agreed by the Engineer.

Achievement of the specification in respect of magnesium sulphate soundness is expected to require the addition of crushed granite which has a Magnesium Sulphate Soundness of only 2-3%.

(c) Filler

All filler shall be stored in dry conditions.

At least 60% by mass of the aggregates passing the 75 microns B.S. sieve shall be added separately to the mixtures as filler.

The added filler shall include approved high calcium hydrated lime (to B.S. 890) as 1.5% by mass of the total aggregate. Additionally it shall comprise a minimum of 90% Calcium Hydroxide. Certificates indicating compliance with B.S. 890 shall be supplied with each consignment of Hydrated Lime.

Filler shall be added to the mixture as part of the fraction passing the 75 microns sieve. If additional filler is required and directed by the Engineer in addition to the 1.5% hydrated lime to improve adhesion it shall be Portland cement in accordance with B.S. 12 (active filler) or crushed limestone/marble (inert filler) complying with the grading below:

B.S. 410 Sieve Microns	Percentage by mass passing	
	Minimum	Maximum
300	100	
75	85	100

1603B GRADING REQUIREMENTS

The grading of the mixture of coarse aggregate, fine aggregate and mineral filler of the working mix shall comply with the medians of the grading envelopes given in Table 16B-1 of the Standard Specification for the asphalt wearing coarse Type I 0/14 and for the asphalt binder course Type I 0/20.

1605B MIXING AND LAYING ASPHALT CONCRETE

1) Design of Bituminous Mixes

The Contractor shall design bituminous mixes in his laboratory using the nominal size of aggregate grading appropriate to the courses described above. He shall submit to the Engineer full details of the sources and gradings of constituent materials he proposes to incorporate in the design.

Trial mixtures of each bituminous mix shall be made up in the mixer the Contractor proposes to use for their manufacture for the Works, with the aggregates proportioned in the various hot-bins or drum to reproduce the aggregate grading of the approved 'Laboratory Mixture' and the binder at mean optimum content.

These trial mixtures shall be laid in approved areas as Preliminary Trials with the spreading and compacting equipment the Contractor proposes to use, and the mixing and laying of the Preliminary Trial mixtures shall continue until the Engineer is satisfied that every reasonable effort has been made to lay the material to meet the requirements of Standard Specification Clause 1604B.

If in the opinion of the Engineer, the Preliminary Trials indicate that the 'Laboratory Mixture' is unsatisfactory for mechanical spreading and compaction, or is a mixture which fails to produce the relevant surface accuracy and texture required by Standard Specification Clause 302 or results in unacceptable surface blemishes, the laid trial shall be removed as directed, the proportion of binder shall be adjusted and the grading of the combined aggregates and filler may also be slightly modified to ensure that at the adjusted binder content, the values of the modified mixture - as may be determined by a further group of tests - remains within the specified limits.

Upon completion to the Engineer's satisfaction of the Preliminary Trials, the Contractor and the Engineer shall agree a Provisional 'Job Standard Mixture' for each specified bituminous mixture.

2) Trial Areas

Trial Areas of the Provisional 'Job Standard Mixture' shall be laid at least one week in advance of the programmed laying of the relevant bituminous mixtures. Details of the Contractors proposals for carrying out these trials shall have been included in the Methods Statement required within 28 days of award of the Contract as specified in Clause 108 of the Standard Specification.

3) Mixing Plant

The Contractor shall submit with his Method Statement full details of the Plant he proposes to use to produce bituminous materials. The mixing plant shall be for the sole use of the Works and shall be sited within the Site.

The plant shall be of a batch type which shall be equipped with two cold hoppers for coarse aggregates and one for fine aggregate. When two or more fine aggregates are to be incorporated in the mixture, a separate hopper shall be provided for each.

The plant shall be equipped so that the hot aggregates can be screened and separated into hot-bins for batching by weight in at least three different sizes into the mixing unit. Hot-bins

shall incorporate means for access to each bin to enable samples to be taken. All drying plant shall be equipped with efficient dust extractors.

The binder shall be separately heated in approved heating tanks with temperature gauges which shall be kept clean and readily accessible.

Before mixing starts, at the end of each month during mixing, and when the plant is moved or disturbed, measuring and recording mechanism and temperature control gauges shall be checked by the manufacturer or an independent testing authority and the Contractor shall submit proofs, certifying that each device is operating accurately or reporting deviation allowances required in respect of each dial, to the Engineer for his retention.

All plant shall be maintained in good working order and shall be subject to inspection by the Engineer.

Continuous type mixing plant will not be acceptable.

4) Handling Aggregates

Aggregates of different nominal size of grading shall be supplied and stockpiled separately. In all cases, separate stockpiles shall be provided for aggregates from different sources of supply.

All aggregates shall be handled from the stockpile or other sources to the cold bins in such a manner as to maintain a uniform grading of the material, care being taken to avoid crushing or mixing of the aggregates and to ensure that they remain free from deleterious matter.

Aggregates from each stockpile shall be lifted into the cold hoppers by a method that will ensure that a satisfactory proportion of each aggregate is fed into the drier, maintaining each hot bin uniformly filled throughout the mixing period.

5) Heating and Mixing

Aggregates including filler shall be thoroughly dry before mixing and the Contractor shall carry out moisture tests at least once a week on a sample from each hot-bin or drier drum. If these tests indicated inadequate drying, mixing shall cease until the drying capacity is augmented to the Engineer's satisfaction.

For bituminous macadam mixtures the mixing temperatures shall be in accordance with Table 1 of BS 4987: Part 1.

At the time of mixing the temperature of the aggregate and binder shall be within 15°C of each other. Reheating of mixtures condemned due to overheating or heat loss or for any other reason shall not be permitted.

During hot sunny weather where the air temperature exceeds 20°C and the substrate temperature exceeds the air temperature by 15°C due to accumulated solar radiation, the mixing, delivery and paver-out temperature may be reduced by 10°C by agreement with the Engineer and provided that the density requirements of the Specification are achieved.

The hot aggregate and binder shall be thoroughly and intimately mixed together in the correct proportions for not less than 1.0 minute after addition of the binder and until every particle of aggregate is completely coated. The mixing period for the hot aggregates, bitumen and filler may be reduced to less than 1.0 minute at the discretion of the Engineer subject to evidence being provided indicating that intimate mixing is achieved at the reduced period of mixing. Filler may be added before or after the binder but mixing shall continue for at least 1.0 minute after the addition of the filler if added after the binder. Mixing time however must be kept to a minimum to reduce oxidisation and current experience in Nairobi is that adequate mixing can be achieved in 30 seconds.

The proportion of filler shall be measured by mass to an accuracy of 2.5kg and a resolution of 1.0kg.

The proportion of binder may be measured by mass or volume.

6) Transporting Plant Mixtures

The Plant Mixtures shall be transported to the laying area in clean vehicles direct from the mixer of the mixing plant without any form of intermediate storage except hot storage described in Clause 1605B (3) above. They shall be covered in an approved manner during transit and while waiting to feed the paver to prevent loss of heat, contamination and wetting.

All vehicles shall be mechanically sound and shall be suitable for the spreading equipment in use, and shall have fully insulated bodies.

When discharging into the spreader, the latter shall approach the vehicle and make contact with the rear wheels of the vehicle.

The rate of delivery to the spreader shall be regulated to enable the spreader to be operated continuously. Intermittent stopping of the spreader shall be avoided.

7) Laying

a) General Laying and Finishing Requirements
Prior to each production or laying period the Contractor shall submit a production schedule to the Engineer for his approval. This schedule shall include such details as mix type, anticipated tonnage, plant to be utilised, joint locations and types of joint etc.

The mixtures shall be spread initially to the depths necessary to give the specified nominal course thickness and to comply with the finished nominal course thickness and to comply with the finished levels and profiles indicated, after compaction.

The maximum thickness of any layer shall be 60mm; therefore in Pavement Types A and E the binder course shall be laid in two layers.

Upper courses shall be firmly united with underlying courses. Each layer or course shall be laid on the preceding layer as soon as practicable. In the case of delay in the pavement construction process the Engineer may require application of an additional tack coat. If the delay is the fault of the Contractor, no additional payment shall be made for this.

The use of hand rakes shall be prohibited when mixtures are laid by spreading and finishing machines except at joint edges. After spreading units have passed, handcasting of fines behind the spreader as a means of making up irregularities or disguising blemishes left by the spreader shall not be permitted.

The temperatures of the plant mixtures in the spreader or layer hopper shall not be less than 125°C.

The Contractor shall supply accurate immersion and surface thermometers and shall check the temperature of the load in the hopper each time the spreader or laying stops and immediately before it restarts, at 30 minute intervals during forward progress and at any time the Engineer directs. The Contractor shall also check the temperature of the bituminous surface immediately before it is rolled. A written record of these temperatures including times and locations where they were read shall be passed to the Engineer at the end of each period of work.

b) Spreading by Machines

Except where the conditions of sub-clause (3) apply, mixtures shall be spread, levelled and tamped by approved self-propelled spreading and finishing machines capable of laying the full 7m carriageway width in one pass and incorporating automatic guidance systems for fine control of pavement profiles, in the form of sensing devices in association with approved longitudinal guide wires, light rays or other approved methods.

Any extension beyond the basic width of the machine shall be strictly in accordance with the Manufacturer's recommendations and shall produce a uniform surface over the full width of the lane to the satisfaction of the Engineer.

As soon as possible after arrival at the laying site the mixtures shall be discharged continuously into the spreader and laid in accordance with the requirements of sub-clause (1) above.

c) Spreading by Hand

Spreading by hand shall only be permitted for filling potholes and minor works as directed such as the replacement of defective surfacing when the areas are small and for areas of irregular shape.

The mixture shall be unloaded with care to avoid segregation onto an existing hard clean surface adjacent to the area where it is to be placed, or, when this is not available, onto an approved metal sheet alongside the area.

It shall then be spread with hot shovels, in a uniform thickness, portion to portion without break and finished with hot hand rakes, by skilled rakers, to the level required to give the correct shape and profile after compaction. Surfacing which is spread by hand shall comply with the density and surface regularity requirements of this Specification.

The Contractor shall not be permitted to lay substantial parts of the works by hand unless he has submitted his proposals for so doing with his tender and obtained the Employer's consent thereto.

1606B COMPACTION

1) Compaction by rolling

Bituminous mixtures shall be compacted until the voids measured in the completed layer are within the ranges of the appropriate ranges tabulated in Table 16B-2 of the Standard Specification.

At least two self-propelled smooth roll rollers shall be used in conjunction with each spreader. Each roller shall have a mass of not less than 10 tonnes nor more than 12 tonnes. At least one of these shall be three wheeled with a static force of rear wheel of between 52.5 and 75 N/mm width. The width of roll of the rear wheels shall not be less than 450mm. This roller shall be used immediately behind the spreader with its driving wheels adjacent to the spreader.

The second roller may be either tandem or three wheeled with a mass of roll between 25 - 70 N/mm width. The use of rubber coated vibrating rollers shall be approved.

A self-propelled pneumatic tyred smooth tread roller with tyre pressure of 0.58 - 0.62 N/mm^2 shall be used between the two smooth rollers specified above or subject to site trials and when approved by the Engineer ahead of smooth roll rollers.

Rolling should commence within 10 metres behind the paver and shall be continued until the voids measured in the completed layer are within the appropriate range. This must be achieved before the temperature falls to 80°C which is the minimum rolling temperature.

When and as approved by the Engineer vibratory compaction is used the mass on the vibrating roll shall be between 4 - 6 tonnes and the load on the vibrating roll contact shall be not less than 2.5 kg.

Rollers shall be operated by skilled and experienced drivers.

2) Compaction by Hand

In places inaccessible to rollers to compact as specified, compaction shall be achieved by tamping with approved mechanical or hand tampers. Hand tampers shall be not less than 25kg and have a face area not exceeding 0065m^2.

3) Compaction Temperature

The temperature of the material in the course after spreading and immediately prior to the beginning of compaction (the "paver out" temperature) shall be not less than 120°C

Laying temperature will normally be about 20°C above ambient subject to the allowable reduction explained in Clause 1605B(3). The minimum paver-out temperature, however, shall be 115°C.

4)Transverse Joints

Transverse joints shall be introduced into the surface at the end of a day's work and whenever an interruption in laying prevents continuity of rolling at the specified minimum temperature. They shall be formed at right angles to the axis of the road.

The exposed edges of the transverse joints in wearing and binder courses shall be saw cut back at least 300mm and vertically trimmed, arisings shall be removed, the underlying surface cleaned and edges painted with hot bitumen immediately before laying continues.

On completion, the joints shall present the same density and texture as the remainder of the surfacing and the accuracy of the surface across the joints

1607B MEASUREMENT AND PAYMENT

(c) Item No. 16.08 Active Mineral Filler
Unit: Tonne

Payment for mineral filler will only be made where the Engineer instructs in writing the addition or substitution of mineral filler to improve adhesion.

(d) Item No. 16.09 Inert Mineral Filler
Unit: Tonne

Payment for sand will only be made where the Engineer instructs in writing the alteration of all or part of the minus 6.3 mm fraction to modify a grading curve which already follows the median of the specified grading envelope.

SECTION 17 - CONCRETE WORKS

1703 MATERIALS FOR CONCRETE

In order to minimise the risk of alkali-silica reaction in concrete and to improve durability of the structures, the following additional conditions need to be satisfied:

(b) Cement

In addition to complying with Kenya Standard Specification KS02-21 for Ordinary Portland cement, cement shall also comply with the 1986 draft revision.of KS02-21, and shall have a guaranteed equivalent alkali content not exceeding 0.6% expressed as the acid soluble alkali content of the cement.

(c) and (d) Fine and Coarse Aggregate

In addition to complying with the requirements of BS 882, BS 1047 and BS 3797, fine and coarse aggregate material not contain opaline silica at any level and the source shall not contain any quantity of flint, chert or chalcedony that could cause damage from alkali-silica reaction.

In recognition of the above and also problem of procuring suitable sand at all times, a proportion of crushed rock quarry fines produced from a secondary plant may be used with the approval of the Engineer.

1704 THE DESIGN OF CONCRETE MIXES

The 'contractor' referred to in Clause 1704 (b) of the Standard Specification is synonymous with 'the Contractor'.

SECTION 20 - ROAD FURNITURE

2001 ROAD RESERVE BOUNDARY POSTS

Road reserve marker posts shall be provided as directed by the Engineer and in compliance with Standard Specification Clause 2001.

2002 FENCING AND GATES

Fencing and gates shall be provided as shown on the drawings and as directed by the Engineer and in compliance with Standard Specification Clause 2002.The rate for fencing shall allow for use of 110 mm nominal diameter cedar fencing posts at 5m centres, 150 mm straining posts at 200 m centres maximum, ends and change of direction points, struts as necessary, droppers at 2.5 m from each post and five strands of 12 SWG two ply galvanised steel barbed wire and all necessary staples, nails and materials.

The depth of struts below ground surface shall be 400 mm, that of straining posts shall be 900 mm and that of posts 600 mm.

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 shown on the drawings and in compliance with the requirements of the "Manual for Traffic Signs in Kenya", Part II and Standard Specification Clause 2004.

2005 ROAD MARKINGS

Road markings shall be provided as shown on the drawings and in compliance with the requirements of the "Manual for Traffic Signs in Kenya", Part I and Standard Specification Clause 2005. Paint for road markings shall be internally reflectorised paint and shall be in accordance with Clause 218d(ii) of the Standard Specification.

2006 GUARDRAILS

1) Flexbeam guardrails

Flexbeam guardrails shall be provided as shown on the drawings and in compliance with the requirements of the "Manual for Traffic Signs in Kenya", Part II and Standard Specification Clause 2006.

2) Double-headed guardrails

Double-headed guardrails shall be provided as shown on the drawings and in compliance with the requirements of the "Manual for Traffic Signs in Kenya", Part II and Standard Specification Clause 2006.

2007 CONCRETE KERBS

1) Vertical joints

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

2) Transitions between flush and raised kerbs

The transition between flush kerb and raised kerb (e.g. at bus bays) shall be termed ramped kerb. The ramped kerb shall consist of 2 units of raised kerb as shown on the drawing thus the transition occurs over 2.0 m

3) Stairways for Bus Stops

Stairways shall be provided at bus stops as directed by the Engineer and as shown on the drawings.

2008 KILOMETRE MARKER POSTS

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

2010 PLANTING OF TREES AND SHRUBS

1) General:

Trees and shrubs are to be planted in the central reserve, on the road shoulders and on the landscaped black cotton soil spoil heaps at Mombasa Road Junction, using topsoil set aside from site clearance as the growing medium, all as shown on the drawings or as directed by the Engineer. The objectives are to provide shade trees for pedestrian traffic, interception of headlight dazzle from oncoming traffic at night, hedges to discourage crossing by pedestrians between the crossing points provided, and an appropriate gateway to the 'garden city' of Nairobi.

2) Detailed Planting Plan Required:

The Contractor shall prepare and submit for the Engineer's approval a detailed planting plan in elaboration of his Methods Statement, to be provided as required under Clause 15 of the Conditions of Contract Part 2, showing the species that are to be planted, colour schemes, and plans for procurement or propagation, planting, watering and maintenance. The importance of saving existing trees wherever possible shall be emphasised and the setting aside of suitable topsoil during site clearance.

3) Ground preparation:

Pits shall be dug and filled with set aside topsoil mixed with well-rotted manure or compost in a ratio of six parts of topsoil to one part of compost. Also to the soil should be added 2 kgs of an NPK fertiliser such as 17-17-17, for an average sized pit. These additives should be well mixed in before the pit is filled. Each 20 cm layer of fill should be well firmed before next layer is added. This is to avoid any air pockets and to prevent subsequent sinkage of the pit. The pit shall be topped off at ground level with a depression in the soil extending to the outside rim of the pit.

The pit shall be watered several times so that it is thoroughly soaked and to allow the water to percolate through the soil before planting. If adequate water is available planting should be done before the rains so that the plants may start to develop new roots and then take advantage of the rain. If water is short it is necessary to wait until at least 75 mm of rainfall has saturated the ground before planting.

4) Planting material:

Planting material shall be well grown container grown plants from reputable nurseries approved by the Engineer. The Contractor shall promptly replace any plants that fail to take root or die.

5) Method of planting:

Measure the height of the container and take out enough soil from the pit so that the top of the soil in the container will be level with the soil in the pit.

To avoid root disturbance the following procedure can be followed: cut round the base of the container to separate the walls from the base. Leave the walls and base in position. Lower the plant into the hole in the pit and then carefully cut the sides of the container. Remove the sides of the container from the pit first and then ease the base out from under the plant. If the ball of the root looks as if it will break or it is found that there is very little root the base can remain in place and soil carefully added to the hole as the sides of the container are eased out of the hole. The soil must be firmly returned to the planting hole and watered well. Mulching newly planted shrubs and bushes with leaves or shavings leaving 8 cm clear round stem of the plant will help to retain moisture and promote growth.

If Bougainvillea is to be planted as a hedge in conjunction with a wire fence the line of posts must be installed before planting. Plant as described above. After planting staple the wire to the posts. If the wire is in position before the plant it is difficult to position the plant properly. The plant is then trained along the line of the wire always filling the bottom wire with branches before tying shoots to the wire above. If the plant is allowed to grow up and is then trained on the top wire the base will never fill up. When all the wires are covered after care is to remove all 'water shoots' and train in all the good flowering wood. For good flowering do not trim with hedge shears.

6) Establishment of the plants:

To establish the plants a good watering of 40 litres for each plant is required once a week until the rains. Then in dry weather 40 - 50 litres of water a week is required until the plant is established about six months after planting.

7) Maintenance:

The fertilizer and compost in the pit will keep the plant growing well for the first six months. At each rainy period a top dressing of well rotted manure or compost should be given plus 250 gms of NPK, e.g. 17-17-17 or 15-15-15-6-4 , spread over the area of the feeding roots (usually the outer limit of the foliage). If the watering is done regularly the feeding can be spread over the year. Pruning, trimming and tying back shall be undertaken as directed by the Engineer

8) Varieties:

Some suitable varieties are as follows:

- Hardy shrubs and trees:

Hibiscus rosa-sinensis	*Hibiscus schizopetalus*
Hibiscus arboreus	*Plumbago capensis*
Lantana camara (hybrids only)	*Tecoma stans*
Tecoma capensis	*Nerium oleander*

- Hardy flowering shade trees for planting on shoulders:

Acacia xanthophloea 'Fever Tree'	*Calodendron capense* 'Cape Chestnut'
Cassia spectabilis	*Delonix regia* 'Flamboyant'
Jacaranda mimosaefolia	*Brachychiton acerifolium* 'Australian Flame'

Spathodea campanulata (nilotica) 'Nandi Flame'

• Hardy acclimatised *Bouganvillea* for hedge planting in the central reserve:

B..floribunda - purple; *B. glabra var sanderiana* - magenta; *B. refulger* - deep purple; Brilliant - flame to cerise; Golden Glow - yellow/orange; Isabel Greensmith - tomato red; Killie Campbell - orange scarlet to magenta; Lady Mary Baring - clear yellow; Mary Palmer - white and dark pink; Mrs Butt - crimson; Mrs H C Buck - garnet; Orange King - orange with pink tinge; Enchantment - white; Ralf Saunder - white with pink tinge.

9) Grassing of Central Reserve

Grassing of the Central Reserve shall be undertaken as specified in Special Specification Clause 524, as shown on the drawings and as directed by the Engineer.

2011 MEASUREMENT AND PAYMENT

(a) Item : Fencing
Unit : m

Fences shall be measured by the metre as erected. The rates for fencing, fence posts, gates shall include for the costs of providing all materials and fittings, fabrication, transportation, excavation in any material, concrete foundations where specified, provision of transport, and compaction of selected backfill, and disposal of surplus material.

(q) Item : Ramped Kerb
Unit : No.

Ramped kerb shall be measured by Number of units whereby one unit shall measure 2.0m.

The rate for ramped kerb shall include for the provision of all materials, excavation in any material, laying, jointing kerb, lean concrete concrete bedding and haunching, backfill, removal of surplus material and complying with the requirements of Clauses 2007 of the Specifications.

(m) Item No. 20.26 Stairways for Bus Stops
Unit: m

Payment shall include for all work required in construction and finishing the stairways for bus stops as shown on the drawings and for provision of appropriate simple handrails as agreed with the Engineer.

SECTION 21 - MISCELLANEOUS BRIDGEWORKS

2101 WATERPROOFING TO STRUCTURES

Notwithstanding Clause 2101 of the Standard Specification, waterproofing to structures shall be applied only when instructed by the Engineer, and shall consist of "Expandite Mulseal D.P."or similar approved. It shall be applied as a prime coat and two other coats all in accordance with the manufacturer's instructions.

The rate of application of the "Mulseal D.P." including the prime coat shall not be less than 1.6 $1/m^2$.

Measurement and payment shall be in accordance with clause 2108 (a) of the Standard Specification.

2102 BRIDGE BEARINGS

After third paragraph - "... as required" insert the following paragraphs :- Bridge bearings shall comply with all relevant clauses of the Specification, the design recommendations of BS 5400: Section 9.1: 1983 and the following together with any other requirement shown on the drawings.

(i) Elastomeric bearings are to be set horizontal whilst the bedding is still plastic. Where bedding greater than the nominal specified is necessary the bearing shall not protrude into the bedding by more than 5mm. The bearing shall not be subjected to any loading until the plinth concrete and bedding has sufficiently hardened.

(ii) Epoxy mortar bedding shall be of suitable formulation for its purpose and shall comply with the requirements of the Specification. Mortar shall mot be mixed or placed in ambient temperatures less than 5^{o} C and shall be protected against harmful effects of weather, including rain, rapid temperature changes and frost at all times until fully cured. Where beams are to be placed, the epoxy mortar shall still be plastic at the time of finally placing the beam and excess mortar is removed to leave a sound vertical surface between the bearing and the beam soffit around the perimeter of the bearing. Temporary beam supports shall be used to ensure that the beam soffits remain horizontal transversely and bearings cannot be over rotated longitudinally. For the purpose of complying with the strength requirements of the Specification in this application first loading shall be deemed loading over and above that stemming from the initial placing of the precast beam.

(iii) Before construction of any bridge bearing shelf the Contractor shall verify that for the thickness of bearing he proposes to use and approved by the Engineer that the bearing can be installed at the required level by either varying the height of the bearing plinths within the permitted range or by constructing the bearing shelf to a new level agreed with the Engineer.

(iv) Where bearing plan sizes other than specified are proposed it shall be shown to the satisfaction of the Engineer that there is adequate clearance between the bearing and the edges of the beam bearing plate and the edges of the bearing plinth.

(v) For the shear stiffness test for elastomeric bearings, the nominal dead load plus superimposed dead load referred to in BS 5400 : Section 9.2 : 1983 Appendix A shall be the permanent vertical design load effect at the serviceability limit state shown in the schedules.

The materials for rubber bearings for bridges shall comply with BS 5400 : Part 9.

Rubber bearings shall be load tested as required in the Contract and in accordance with BS 5400 : Part 9. Bearings for such tests shall be selected by the Engineer.

The materials for rubber bearings shall be tested in accordance with BS 5400 : Part 9.

Any or all of the above load tests and materials tests may be waived by the Engineer should the Contractor demonstrate to the satisfaction of the Engineer that tests on materials and bearings of similar manufacture and size comply with the requirements of BS 5400 : Part 9

2103 MOVEMENT JOINTS AND SEALANTS

After last sentence insert the following paragraphs :-

e) Preformed Joint Filler

Preformed joint filler shall be of the thickness described in the Contract within a tolerance of $\pm$ 1.5mm and of such depth that the groove above it shall comply with Clause 1011 for pavements or as described in the Contract for bridges, and in suitable lengths each not less than 1.2m. Holes to accommodate dowel bars shall be accurately bored or punched out to be a sliding fit on the dowel bars.

The material comprising joint filler shall be of such quality that it can be satisfactorily installed in position at the joint.

Knot-free softwood may be used for carriageway joints but not for bridge joints. Materials other than knot-free softwood shall comply with the following tests :-

(i) Extrusion Test

Test specimens measuring 115mm x 115mm shall be tested before weathering by compressing to 50 per cent of the thickness with 3 edges restrained. The amount of extrusion of the free edge must not exceed 6mm.

(ii) Weathering Test

Test specimens shall be exposed to a temperature of 50^{o} C for 7 days and shall then be immersed in water at room temperature for 24 hours. The temperature shall then be lowered gradually to -7^{o} C $\pm$ 1^{o} C which temperature shall be maintained for 4 hours. Then the temperature of the specimen shall be raised gradually to between 18^{o} C and 38^{o} C until all the ice has melted. After 5 freezing and thawing cycles have been completed, the specimens shall be removed from the water and allowed to stand in air at room temperature for 48 hours. The specimen will have passed this test if it then shows no signs of disintegration.

(iii) Compression and Recovery Test

Specimens which have been subjected to the weathering test shall be given 3 applications at 24 hour intervals of a constant stress sufficient to compress the materials to 50 per cent of its thickness before test. The stress to attain this compression shall be not less than 0.07 N/mm^2 nor more than 10.4 N/mm^2 nor more than 0.4 N/mm^2 for material to be used for type B. At the end of the series of applications and removals of the stress the material shall recover at least 70 per cent of its thickness before test within a period of 2 hours after the release of last loading.

Certificates that the material has complied with the foregoing tests shall be supplied by the manufacturers.

Preformed joint filler shall be fixed firmly against the surface of the concrete already in place in such a manner that it will not be displaced when concrete is deposited against it. Where it is necessary to use more than one piece of filler to cover any surface, the abutting pieces shall be placed in close contact and the joint between them shall be covered with one layer of bitumen-saturated roofing felt of not less than 18kg grade, one side of which shall be covered with hot bitumen to ensure proper retention.

The 25mm deep space above the joint filler shall be cleaned after concrete has been poured and, when dry, filled flush with joint sealing material.

2104 METAL PARAPETS

Delete "PIPE HANDRAIL TO BRIDGES" and the following two paragraphs, and insert the following paragraphs :-

The requirements of Section 19 shall apply generally to all parapet fabrication and installation.

When directed by the Engineer and before fabrication is commenced, welding procedure trials shall be carried our using representative samples of materials to be used in the Work.

A penetrating dye or other non-destructive method of testing agreed with the Engineer shall be used to examine the welds selected by the Engineer.

When parapets are erected they shall be securely held in the correct position until all connections and fastenings are complete and the post fixings have gained sufficient strength to withstand the design holding-down moment. The assessment of the strength of the post fixing shall be subject to the Engineer's agreement.

2106 SURFACING TO BRIDGES

The surface to the bridge decks shall be 40mm of Asphalt Concrete Wearing Course Type I laid to the tolerances given in Section 3 of the Standard Specification.

The surface of the concrete deck to be treated shall be cleaned of all dirt, dust and grease. Immediately after cleaning the concrete surface shall be sprayed with a prime coat of MC 70 at the rate of 0.5 litres/m^2.

2107 WEEPHOLES AND DECK DRAINAGE

Replace the whole Clause with the following:

Where shown on the Drawings or direction by the Engineer the Contractor shall cast weepholes and deck drainage into concrete. The Contractor shall provide and place plastic pipe of the diameter shown on the Drawings and shall be firmly held in position during the placing of the concrete and shall be cut flush with the face of the concrete. A 500mm x 500mm square of ' Terram' (of weight 280 g/m^2) or similar approved fabric shall be placed, central on the weephole between the concrete wall and the back fill material.

2108 MEASUREMENT AND PAYMENT

(b) Item: Bridge bearings
At end of Clause - Delete full stop and insert " , including inter alia the provision of all necessary holes, dowels, dowel caps, mortars and temporary supports.

(c) Item: Movement joints and sealants

At end of Clause delete " the Special Specification", insert " this Specification".

(d) Delete - " Pipe handrail and guardrail to bridges" and the following three paragraphs:

Substitute - Metal parapets and guardrails to the bridges.

Unit: m

Metal parapets and guardrails to bridges shall be measured by the metre as the instructed length of metal parapet and guardrail to be erected.

The rate for metal parapets and guardrails to bridges shall include inter alia for the following:

(i) Surveying the structure as built and providing working drawings.

(ii) Providing facilities for the Engineer to test welding at the place of manufacture during fabrication.

(iii) Supply of materials and delivery to site complete with all fittings, sockets, holding down fixings, posts and rails.

(iv) Casting in sockets or other forms of fixing.

(v) Erecting parapets and guardrails including site fabrication welding and bedding materials.

(vi) Making good any damage or defects before and after application of surface treatment.

(vii) Protective painting or other surface treatment at the place of manufacture or elsewhere and any remedial treatment required on site.

(viii) Connection of guardrails to metal parapets.

(ix) Provision of all splices, movement joints and panel joints.

(e) Item: Surfacing to bridges

Unit: m2

(g) Item: Deck drainage pipes

Unit: no of each diameter

Deck drainage pipes shall be measured by the number instructed by the Engineer to be placed.

The rate for deck drainage pipes shall include for the cost of providing and casting the plastic pipe into the concrete and complying with the requirements of Clause 2107 of ththe Special Specification.

(h) Item: 200mm perforated PVC pipe for drainage of porous fill

Unit: m

Payment shall cover provision, perforation and installation as shown of the drawings, all to the approval of the Engineer.

SECTION 22 - DAYWORKS

2202 MEASUREMENT AND PAYMENT

Notwithstanding the provision of this Clause, payment for works instructed to be carried out under this bill shall be paid for in accordance with the rates entered in the Bills of Quantities, irrespective of the total of the Bill carried forward to the summary during the tender stage.

SECTION 23 - PILING

2301 CODE OF PRACTICE

All workmanship, materials, tests and performance in connection with the piling work shall be in conformity with the B.S. Code of Practice CP 2004: Foundations.

2303 ACCESS TO SITE

The Contractor is to make allowance in his rates for any methods or other means of support to his piling machines which he may require to travel and work on the site and he is to make every allowance in his rates for bringing plant and materials on and off the site.

2304 OBSTRUCTIONS

Should the Contractor encounter, in the driving of boring piles or linings, any unnatural obstructions which cannot be removed or displaced by normal methods, he shall immediately inform the Engineer who may order the obstruction to be removed, payment being made by daywork rates, or the pile to be relocated. If the pile is to be relocated, the hole for the original pile shall be cleaned out and backfilled, to the satisfaction of the Engineer, with Class 25/20 concrete to the level directed by the Engineer. The Contractor will be paid for the work at the same rate as for the good piles, the payment length being from the cut off level directed by the Engineer to the base of the hole. In the event that the Engineer orders the obstruction to be removed, then the standing time for the piling rig in excess of two hours from the time of informing the Engineer of the obstruction, shall be paid by the rig hour rate. This rate shall be deemed to cover all the costs incurred by the rig standing. Standing time less than 2 hours from the time of informing the Engineer of the obstruction will not be paid for.

2305 SETTING OUT

The Contractor shall be responsible for setting out the substructure bases and the positions of piles and shall maintain the setting out of the substructure bases, whilst carrying out his work. No separate payment shall be made for this work and the Contractor must make allowance for this, in his rates for piling.

2206 STEEL PIPE PILING

Vehicle Bridge No. 3 at Chainage 27+940 will be founded on 8m long, 9mm thick, 500mm diameter steel pipe piles as shown on the drawings. No test-piles will be required but observation of blow-counts will be made as directed by the Engineer in confirming the bearing capacity of piles as driven and level of cut-off if required.

2307 POSITION AND CUT-OFF LEVEL OF PILES

All piles are to be formed to within 75 mm of the position shown on the drawings, and shall be plumb within a tolerance of 1 m in 75 m. If any pile deviates from the required position by more than this amount, the Contractor will be required to provide two further piles free of charge, or alternatively, will be required to pay the additional cost of enlarging the pile caps. No method of forcible correction will be permitted. The cut off level of the piles must in no case be lower than shown on the drawings, and should not project more than 150 mm above these levels, unless otherwise specified or directed by the Engineer. If it is found on excavation after piling that these levels have not been maintained, the additional costs of making up or cutting down the pile will be at the Contractor's expense.

2308 PILES AND PILING - GENERAL

Full details of the Contractor's proposed piling method, giving the number and type of rigs, type of tools and equipment as well as details of supervisory staff and their previous experience, should be submitted to the Engineer, for his approval at least 21 days before the Contractor proposes to commence piling. The Contractor shall not be permitted to commence piling until he has received written approval from the Engineer covering all aspects of the piling. This approval shall not relieve the Contractor of his responsibilities for the piles. Should the Contractor subsequently wish to change any aspect of his proposals, the written approval of the Engineer shall be obtained prior to such changes being effected.

The following notes are general and should be construed in the light of any special requirements for the piling system.

1) During concreting, care should be taken to prevent the formation of voids in the piles. A record shall be kept of the volume of concrete placed and the calculated volume of each pile.

2) In the case of all piles, care shall be taken not to damage previously formed piles.

3) Ingress of water into excavations shall be prevented. However, where subsoil water, which cannot be sealed off, is encountered, the water in the bore shall be maintained above the standing level of the subsoil water.

4) The Contractor shall, at his expense, dispose of all spoil from boreholes to a tip provided by himself to the satisfaction of the Engineer. As each borehole is excavated the Contractor shall, if required by the Engineer, take samples of the strata and test them or carry out site tests, as required in accordance with B.S. Code of Practice 2001.

2309 CONCRETE FILLING OF PILES

1) Linings

Excavation for piles shall, if the Engineer considers that ground conditions require it, be completely or partially lined with temporary approved steel casing. Casings shall be installed by driving or by other methods approved by the Engineer. A minimum length of 1.5 m of temporary casing shall be inserted at the top of every borehole, unless otherwise agreed by the Engineer, to prevent the ingress of soil, debris etc., into the top of the excavation.

2) Excavation of Material from Borings

Excavation shall be carried out as rapidly as possible. In any case, a pile shall be filled with concrete within 18 hours after the start of excavation.

No concrete shall be placed in a pile until the excavation has been inspected by the Engineer and his written approval of concreting has been obtained. Where applicable, any water shall be completely removed or expelled immediately before placing the concrete. If any soil falls whilst concreting is in progress, it shall be immediately removed.

The concrete shall be placed by methods approved by the Engineer, in one continuous pour, unless the Contractor shall have previously obtained approval of the Engineer of the positions of construction joints in concreting and the details of such joints. Where it is not practicable to remove or expel ground water from the finished bore, the concrete shall be placed by tremie tube.

The top of the concrete shall be brought to such a level as to permit the cutting off of any laitance and weak concrete, and the Contractor shall be responsible for finishing the shafts to the required cut-off level in sound dense concrete.

All plant and operations employed in the formation of the pile shall be such as to ensure that the full cross-section of the pile is maintained, and no waisting occurs.

The Engineer may require one or more of the working piles per bridge to be tested as specified. The Engineer will inform the Contractor of his intention to test a particular pile immediately after concreting is completed, the particular bridge site, and the 7 day cube test results have been obtained.

Care shall be taken to protect immature concrete from damage by the elements, vibration or any other cause whatsoever, but in the event of any new concrete becoming so damaged, the Contractor shall remove it and made good as directed and to the satisfaction of the Engineer, at his own expense.

2310 CONCRETE

All materials for the concrete shall comply with the relevant sections of the Specification.

The grade of concrete to be used in the Works shall be as required to suit the pile design, and shall comply with the requirements of the Specification. The concrete shall be 25/20, but the minimum cement content shall be 300 kg/m and the slump shall be between 75 mm and 125 mm. If the concrete is to be placed using a tremie pipe due to the presence of water in the hole, then the minimum cement content shall be increased to 400 kg/m and the slump should be greater than 150 mm.

The cement in all piles is to be fully compacted by tamping, vibrating or other means to suit the type of pile employed, to the satisfaction of the Engineer.

2311 SITE SUPERVISION

Full details of the Personnel in charge of the piling operation, including their qualification and experience, shall be submitted by the Contractor to the Engineer for his approval. He shall also retain an approved and competent English speaking foreman on the Works whilst piling in progress.

2312 RECORDS OF PILING

A daily return is to be made to the requirements of the Engineer and a weekly return in duplicate is to be sent to the Engineer, giving full details of the piling carried out, including such details as :-

(a) Pile description and reference number
(b) Date and time of installation
(c) Date concreted
(d) Type of rig used for installation including details of tools
(e) Length of temporary lining during installation
(f) Length of permanent lining
(g) Strata and ground water encountered
(h) Obstructions encountered
(i) The level of the finished pile, concrete mix details, cube numbers, quantity of concrete used, details of reinforcement and other relevant details.
(j) Volume of concrete poured in each pile.

In addition the Contractor shall keep at the Site of the Works, copies of all the drawings, specifications, instructions and a complete log and records of all piles formed or driven with details of sets obtained, if any, and the actual length of each completed pile. These shall be available from the Engineer for inspection at all times. The Contractor shall give every assistance to the Engineer to enable him to keep a similar record.

2313 ALTERNATIVE TYPE AND DESIGN OF PILING

The Contractor shall be permitted to present an alternative system of piling which he considers to be more suitable for the bridge sites, soil conditions and the loads to be carried. This alternative shall be presented together with the Bill of Quantities for the other works and should include full details of the design method, type and compliance with the various Codes of Practice. The alternative system shall be used subject to the final approval by the Engineer.

2314 MAINTENANCE

A maintenance period of one year shall be catered for by the Contractor after completion of all the piling work. Any defects occurring within this period shall be rectified by the Contractor to the entire satisfaction of the Engineer.

2315 MEASUREMENT AND PAYMENT

a) Item: Supply of Steel Pipe Piles
Unit: m
Supply of steel pipe piles shall be measured in accordance with the actual length ordered by the Engineer or shown on the drawings.

(b) Item: Boring/Driving Steel Pipe Piles
Unit : m
Payment shall be based on the actual length driven or bored.

(c) Item: Filling of Piles with Concrete
Unit: m3
Payment shall be based on the measured volume of concrete place.

FURNITURE FOR THE ENGINEER'S STAFF HOUSES

New furniture to the approval of the Engineer shall be provided in the Engineer's Site Accommodation to the following scales:

Item	Type I	Type II	Type III	Type IV	Type V
Double bed with mattress	1	1	1		
Single bed with mattress	4	2	2	2	2
Dressing table with mirror	3	2	-		
Stool (for dressing table)	3	2	-		
Chest of drawers (with mirror)	2	2	2		
Wardrobe (hanging & shelved)	3	2	2	2	2
Bedside cabinet	6	4	3		
Bedside light	6	4	3		
Stool (for bathroom)	2	1	1		
Shaver power point	2	1	1		
Medicine cabinet with mirror	2	1	1		
Bedroom chair	4	3	3		
Dining table	1	1	1	2	
Dining chairs	8	6	6	3	4
Sideboard	1	1	1		
Lounge chairs	4	4	4		
Settee (3-seat settee)	1	1	1		
Coffee table	2	1	1		
Occasional tables	3	3	2		
Bookcase	1	1	1		
Standard lamp	2	1	1		
Writing table	1	1	1		
Wall lights	4	4	2		
Kitchen cabinet	1	1	1		
Kitchen table	1	1	1	2	2
Kitchen chair	2	1	1		
Water filter	1	1	1		
Refrigerator (350 litres capacity), incl. a deep freeze compartment (100 litres capacity)	1	1	-		
Ditto but 280 litres capacity	-	-	1		
Hurricane lamps	2	2	2		
Shower with curtain	2	1	-		
Towel rail	2	1	1		
Shelves for kitchen	1 set	1 set	1 set		
Lampshades	.....for all lights.....				
Curtains with pelmets	.....on all windows.....				
External security lights	2	2	2		
Dustbins	1	1	1	1	1
Electric Cooker (with four rings, grill and oven)	1	1	-		
Gas Cooker (four burners, grill and oven)with two gas cylinders)	-	-	1		
Two plate kerosene stove				2	2
Electric Fan	2	2	1		
Fire Extinguisher	1	1	1		
2kW electric immersion heater	1	1	1		

OFFICE AND LABORATORY FURNITURE AND EQUIPMENT FOR THE ENGINEER

The Contractor shall supply the following furniture and equipment for the offices and laboratory of the Resident Engineer.

1) Resident Engineer's Main Office Furniture

-	Writing desks (1.5 x 0.9m) with lockable drawers.	No.	5
-	Writing desks (1.35 x 0.75m) with lockable drawers	No.	3
-	Office tables (1.8 x 0.9m)	No.	2
-	Plan filing cabinets	No.	2
-	Chairs, standard desk type	No.	12
-	Chairs, executive swivel type	No.	5
-	Drawing table stools (0.7m high)	No.	2
-	Typist desk	No.	1
-	Typist chairs	No.	1
-	Lockable steel cupboards	No.	5
-	Lockable steel filing cabinets (4-drawers)	No.	2
-	Refrigerator of 220 litres capacity	No.	1
-	Bookshelves	No.	5
-	Conference table	No.	1
-	Chairs for conference table	No.	8
-	Drawing tables	No.	6
-	Writing desks (1.35 x 0.75m) with lockable drawers.	No.	2
-	Chairs, standard desk type	No.	2
-	Laboratory stools (0.7m high)	No.	6
-	Lockable steel filing cabinet (4-drawers)	No.	1
-	Lockable steel cupboard	No.	1
-	Refrigerator of 220 litre capacity	No.	1
-	Bookshelves	No.	1

2) Resident Engineer's Laboratory Furniture

- Laboratory benches as specified	No.	1
- Shelves along outside walls	No.	1
- Writing desks (1.35 x 0.75m) with lockable drawers	No.	2
- Chairs, standard desk type	No.	2
- Laboratory stools (0.7m high)	No.	6
- Lockable steel filing cabinet (4-drawers).	No.	1
- Lockable steel cupboard	No.	1
- Refrigerator of 220 litre capacity	No.	1
- Bookshelves	No.	1

3) Resident Engineer's Main Office Equipment

- Camera, single lens reflex type	No.	1
- Electric typewriter with self-correcting facilities	No.	1
- Filing trays	No.	12
- Stapling machine (large)	No.	1
- Stapling machines (regular)	No.	6
- Paper punches, heavy duty	No.	2
- Paper punches, ordinary	No.	6
- Pairs of scissors	No.	6
- Waste paper bins	No.	8
- Desk mounted pencil sharpeners	No.	6
- Electric fans	No.	6
- Electric heaters	No.	6
- Fire extinguishers	No.	4
- First aid kits	No.	2
- Cooker, 2 plate, electric	No.	1
- A0 size drawing board on adjustable metal stand with parallel motion	No.	1
- A0 size drawing board	No.	2
- A0 size Tee squares	No.	2
- 250mm Set squares 45 degree	No.	6
- 250mm Set squares 60 degree	No.	6
- Protractor for tachy plotting with interchangeable scales	No.	2
- Fully divided scales (metric 1/1000, 1/2500, 1/500, 1/1200, 1/2000, 1/50, 1/250, 1/1500).	No.	6
- Erasing shield	No.	2
- Circular template	No.	2
- Arrow template	No.	2
- Complete compass set	No.	1

-	Set of drawing instruments Staedler	No.	3
-	Set of Rotring pens complete with set of stencils	No.	4
-	Adjustable planimeter, Ott 30010 or equivalent	No.	1
-	Protractor 360 degree	No.	4
-	Electronic calculator with paper printout, 12 figures, with 10 rolls of paper	No.	1
-	Electronic scientific calculator, 12 figures with trigonometric functions	No.	10
-	IBM compatible micro-computer with 40 MB hard disk, 3.5" floppy drive, monochrome display/graphics, alphanumeric keyboard, MS DOS 3.3, Basic, Lotus 1-2-3, Wordperfect, Wordstar, and 20 Nos. 3.5" diskettes	No.	1
-	Wide carriage 16-pin dot matrix printer including parallel cable (2m) and 20 spare ribbons	No.	1
-	Desk top photocopying machine A3/A4 with size reduction and enlargement facilities	No.	1