LABORATORY EQUIPMENT FOR THE ENGINEER

The Contractor shall provide and maintain in good repair for the duration of the Contract, the concrete, soils and bituminous materials testing apparatus listed below which shall be made available to the Engineer not later than three (3) weeks after the Engineer's order to commence the Works and shall continue to be made available for the Engineer's exclusive use throughout the Contract Period. All the equipment shall be purpose made for use in soils testing laboratory and shall comply with the relevant British (BS) or American (AASHTO) Standard.

1) Compaction Test (AASHTO T.99 and T.180)

- Compaction mould complete with base plate extension collar, 101.6mm internal diameter x 116.43mm high	No.	10
- 2.495 kg compaction hammer, drop regulated to 304.8mm	No.	5
- 4.536 kg compaction hammer, drop regulated to 457.2mm	No.	5
- Aggregate compaction mould to BS.5835 complete	No.	10
- Loading frame for the Kango hammer (to BS.5835)	No.	1
- Electric vibrating Kango hammer with steel tamper	No.	1
- Steel straight edge 300mm long x 25mm wide x 3mm thick	No.	6
- Compaction mould 152.4mm dia. x 116.43mm high complete with base plate and extension collar	No.	10

2) Density Test (Sand replacement method BS 1377)

- Galvanized metal tray 1m x 0.5m x 75mm deep	No.	2
- 75mm brush	No.	6
- Semi-automatic balance, 25 kg capacity, accurate to 1 g, including weights	No.	2
- Metal containers, 450mm dia.	No.	6
- Stainless steel tray, 305mm dia.	No.	3
- Metal tray with 100mm diameter hole in the centre, 300mm x 300mm square	No.	3
- Metal tray with 150mm diameter hole in the centre, 300mm x 300mm square	No.	3
- Metal tray with 200mm diameter hole in the centre, 457mm x 457mm square	No.	3
- Steel pegs for fixing tray in position	No.	36
- Sand pouring cylinder, 100mm diameter	No.	3
- Sand pouring cylinder, 150mm diameter	No.	3
- Sand pouring cylinder, 200mm diameter	No.	3
- Cold steel chisel, 25mm x 300mm long	No.	6
- Cold steel chisel, 10mm x 250mm long	No.	6
- 1.8 kg hammer	No.	6
- Scoop for removing excavated material from hole, 250mm long handle	No.	6
- 100mm brush, soft	No.	6

-	Metal dibber	No.	6
-	Scraper	No.	6
-	Steel pointed rod	No.	6
-	Density spoon	No.	6
-	50mm brush, soft	No.	6
-	Calibrating can, 100mm diameter x 150mm deep	No.	3
-	Calibrating can, 150mm diameter x 200mm deep	No.	3
-	Calibrating can, 200mm diameter x 250mm deep	No.	3
-	Polythene container jars, with neck 125mm diameter and 4 litre capacity	No.	6
-	Standard sand 600/300 micron, 50 kg bag	No.	10

3) Density (Nuclear Density Method, AASHTO T238)

-	Nuclear moisture/density gauge (Troxler 3411B or similar approved)	No.	1
-	Hole forming device	No.	1
-	Guide for the above	No.	1

4) Atterberg Limits Apparatus to BS 1377

-	Casagrande liquid limit apparatus	No.	4
-	Grooving tool	No.	4
-	Liquid limit penetrometer	No.	2
-	Penetration test cone	No.	2
-	Penetration sample cap	No.	2
-	Linear shrinkage mould	No.	20
-	Vernier calliper, 150mm x 0.1mm	No.	2
-	Stainless steel, 3mm dia. and 100mm long	No.	4

5) Sand Equivalent

-	Sand equivalent test set	Set	2

6) Specific Gravity (BS.1377 and BS.812) and Water Absorption (ASTM D 2041 - 78)

-	Pycnometer for sands and fine aggregate, 1 kg capacity, complete with cone and rubber seal.	No.	10
-	Glass Plastic or metal bowl having a capacity of at least 1000 ml strong enough to withstand a full vacuum complete with cover fitted with rubber gasket and a hose connection.	No.	10
-	Volumetric flas having a capacity of at least 1000 ml strong enough to withstand a full vacuum complete with rubber stopper and a hose connection.	No.	10

-	An intermediate size heavy wall glass pycnometer having a capacity of approximately 4000 ml or a large size polycarbonate plastic pycnometer having a capacity of at least 10 000 ml complete with a suitable vacuum connection assembly consisting of a vacuum gauge, release valve, and tubing connector, plus a tapered stopper device for maintaining consistent volume regulation.	No.	10
-	A manometer or vacuum gauge suitable for measuring the specified vacuum	No.	1
	A constant temperature water bath of a suitable size for the 4000 ml pycnometer	No.	1
-	Gay Lussac specific gravity bottle, 25ml.	No.	10
-	Gay Lussac specific gravity bottle, 50ml.	No.	10
-	Wire mesh basket with apertures not greater than 6.5mm large enough to take 2.5 kg of aggregate	No.	1
-	Stout watertight container in which the basket can be freely suspended under water	No.	1
-	End-over-end shaker	No.	1
-	Gas jar, 300mm high x 75mm dia. with glass plate and rubber stopper	No.	10
-	Vacuum type desiccator, 200mm dia	No.	2
-	Vacuum pump, 1 HP, capable of evacuating air from the container to a residual pressure of 30 mm Hg (4.0 kPa) or less.	No.	1
-	Rubber headed pestle	No.	2
-	Soft absorbent cloth (tea towel)	No.	20
-	Shallow tray of area not less than 0.065m^2.	No.	2
-	Airtight container of similar capacity to the basket	No.	1
-	5 kg balance accurate to 0.1g capable of suspending the basket plus sample in the watertight container	No.	1
-	Hair drier	No.	1
-	Sand absorption cone and tamper	No.	2
-	Pycnometer for the above	No.	2

7) Flakiness Index (BS.812)

-	Flakiness sieve, 4.9 x 30mm slot	No.	2
-	Flakiness sieve, 7.2 x 40mm slot	No.	2
-	Flakiness sieve, 10.2 x 50mm slot	No.	2
-	Flakiness sieve, 14.4 x 60mm slot	No.	2
-	Flakiness sieve, 19.7 x 80mm slot	No.	2
-	Flakiness sieve, 26.3 x 90mm slot	No.	2
-	Flakiness sieve, 33.9 x 100mm slot	No.	2

8) Sieve Analysis (BS.1377)

-	BS sieve 300mm diameter in sizes 75, 63, 50, 37.5, 28, 20, 14, 6.3, 5 and 3.35mm plus lid and receiver	Set	4

-	BS sieve 200mm diameter in sizes 2, 1.18, 0.6, 0.425, 0.300, 0.212, 0.150, 0.075 and 0.063mm plus lid and receiver	Set	4
-	Electric sieve shaker	No.	1
-	BS sieve 200mm diameter, 0.425 and 0.075mm	Set	10
-	Field rocker sieve set	Set	4

9) CBR Test (AASHTO T.193)

-	CBR mould, 152mm dia. x 178mm high, complete with perforated base plate and extension collar 50.8mm high that can be fitted to either end of the mould.	No.	30
-	Spacer disk	No.	6
-	Perforated swell plate with adjustable centre post of rust proofed steel provided with a lock nut.	No.	6
-	Sliding weight rammer, 2.49 kg	No.	3
-	2.27 kg annular surcharge weight	No.	30
-	Static compaction press, 50 tonnes capacity with an adjustable platten speed between 1mm/min. and 50.8mm/min. (Hydraulic or mechanical operation and hand operated)	No.	1
-	Set of guards	No.	1
-	CBR/Marshall motorised dual speed 60 kN load frame, ASTM	No.	1
-	Stabilising bar for the above	No.	1
-	Proving ring for above, 10 kN and 50 kN capacity.	Set	1
-	Penetration gauge range 0 - 25mm	No.	1
-	CBR piston, including bracket	No.	1
-	Swell measurement tripod complete with gauge calibrated in 0.01mm divisions	No.	30
-	Soaking tank for CBR mould sufficient for 200 moulds	No.	1
-	Tamping bar, steel 13mm diameter, 380mm long	No.	1

10) Miscellaneous Equipment

-	1m x 1m x 75mm deep galvanised metal tray	No.	10
-	1.5 kg hammer	No.	4
-	Riffle box with 10mm slots (BS.1377)	No.	2
-	Riffle box with 20mm slots (BS.1377)	No.	1
-	Riffle box with 50mm slots (BS.1377)	No.	1
-	Wheel barrow	No.	4
-	Dustpan brush	No.	4
-	Plastic funnels, 65mm dia	No.	2
-	Plastic funnels, 100mm dia	No.	2
-	Plastic funnels, 140mm dia	No.	2
-	Shovel	No.	6
-	Pick-axe	No.	6
-	Metal scoop, large, 150mm wide	No.	4

-	Metal scoop, medium, 100mm wide	No.	6
-	Schmidt concrete test hammer	No.	1
-	Jack, 20 tonne, lever, frame, sample extruder	No.	1
-	Garden trowel	No.	4
-	Steel rule, 500mm long	No.	3
-	Stop watch	No.	1
-	Steel tray, 0.3m x 0.3m x 0.01m deep	No.	40
-	3.5 kg hammer	No.	4
-	7 kg hammer	No.	3
-	Complete sand patch test apparatus	No.	1
-	Cold chisel	No.	6
-	Oven, electric thermostatically controlled to any temperature between 60 deg. and 149 deg.C, minimum capacity including dial thermometer range 0-160 deg.C (BS.1377).	No.	2
-	Gas for the above oven	No.	2
-	Single plate electric cooker	No.	4
-	3 metre straight edge including calibrated wedges	No.	1
-	Desiccator, 300mm dia.	No.	2
-	Straight edge, 300mm long, 25mm wide and 3mm thick	No.	6
-	Moisture content tin, 75mm dia. cadmium plate or aluminium	No.	100
-	Concrete beam moulds 150 x 150 x 750mm	No.	24
-	450mm x 450mm x 9mm plate glass (BS.1377)	No.	4
-	Refrigerator 250 litre capacity	No.	1
-	Palette knife 200mm blade	No.	6
-	Palette knife 100mm blade	No.	6
-	BS Sieve brush	No.	8
-	200mm x 200mm x 20mm cadmium plated or aluminium tin	No.	50
-	Electronic balance capacity 600 g, accurate to 0.001 g	No.	1
-	Electronic balance capacity 1600 g, accurate to 0.01 g	No.	1
-	Electronic balance capacity 5000 g, accurate to 0.1 g	No.	1
-	Balance (Chain dial) 250 g capacity to 0.01 g	No.	1
-	Balance 2000 g capacity accuracy to 0.1 g (manual), including weights	No.	1
-	Balance 4000 g capacity accuracy to 1.0 g (manual), including weights	No.	1
-	Balance 12000 g capacity accuracy to 1.0 g (manual), including weights	No.	2
-	Balance 50 kg capacity accuracy to 20 g, including weights	No.	1
-	Load rings with dial gauges, 10kN	No.	1
-	Load rings with dial gauges, 14kN	No.	1
-	Load rings with dial gauges, 20kN	No.	1
-	Load rings with dial gauges, 28kN	No.	1

-	Load rings with dial gauges, 50kN	No.	1
-	Still for producing distiled water	No.	1
-	Polythene or glass 20 litres storage vessel with tap at bottom	No.	1
-	Petrol driven core cutting machine with all accessaries	No.	1
-	Core cutting compound	kg	1,000
-	Vernier callipers, 250mm	No.	2
-	Benkelman beams	No.	2
-	Average least dimension gauge	No.	2
-	Lockable tool box containing: 1 pair "Molegrips", 2 x 150mm screwdriver 2 x 200mm screwdriver, 2 x 300mm screwdriver, (1 Standard and 1 phillips head of each) adjustable spanners 200mm and 300mm, 1 pair round-nosed pliers, 1 pair general purpose pliers, 1 plastic faced mallet (1 kg), 1 set imperial spanners 1/4" to 15/16", 1 set metric spanners 8mm to 20mm, 2 tyre pressure gauge range 0-100 p.s.i.	No.	1
-	Plastic or metal bucket including lid, 10 litres capacity	No.	20
-	Polythene wash bottle (500ml)	No.	10
-	A4 size clipboard	No.	20
-	Mercury thermometer, range -10 deg.C to 150 deg.C, glass (BS.593)	No.	10
-	Laboratory thermometer, range +50 deg.C to 250 deg.C (BS.593)	No.	1
-	Maximum and minimum thermometer (BS.692)	No.	1
-	Rain gauge	No.	3
-	Portable dial thermometer +50 deg.C to 250 deg.C accurate to + - 3% with 0.6m long stem.	No.	2
-	Pocket dial thermometer +50 deg.C to +250 deg.C accurate to + - 3% with 0.1m long stem.	No.	10
-	5 litre capacity steel storage container with leak and dust proof lids for storage of bitumen samples	No.	100

11) Standard Specifications

Copies of each of the following Standard Specifications:

-	BS.812	No.	1
-	BS.882	No.	1
-	BS.1377	No.	1
-	BS.1881	No.	1
-	BS.1924	No.	1
-	BS.5835, Part 1	No.	1
	ASTM D2041-78	No	1
-	Standard Specifications for Transportation Material and Methods of Sampling and Testing (AASHTO) Part I and II, 13th Edition.	No.	1

12) Concrete: Slump and Cube Manufacture (BS.1881)

-	Slump cone, tamping rod and base	Set	2

-	Concrete cube mould, 150mm	No.	20
-	Soaking tank for cubes, capacity 50 Nos.	No.	1
-	Cube tamping bars for Item 1.252	No.	1
-	Water test set for concrete mixing water	No.	1
-	Potential alkali reactivity of cement-aggregate combinations	No.	1
-	Mortar bar container	No.	3

13) Concrete Cube Compression Testing and Lean Concrete Unconfined Compressive Strength Testing

-	Concrete compression machine, to BS.1610 Grade A with 300mm gauge, rectangular platens, capacity 1560 kN with load pacer	No.	1
-	Safety guard for Item 1.255	No.	1
-	50mm distance piece	No.	1
-	70mm distance piece	No.	1
-	100mm distance piece	No.	1
-	Mechanical load pacer	No.	1
-	Tamping rod, 16mm dia. x 600mm long	No.	2
-	Tamping bar, 380mm x 25mm square	No.	2
-	Tamping rod, 10mm dia. x 250mm long	No.	2
-	Electric vibrating hammer 750 watt with tamping food square	No.	1

14) Potential Alkali Reactivity of Cement-Aggregate Combination and Mortar Bar Container

-	Comparator mould (25.4 x 25.4 x 285mm)	No.	3
-	Length comparator	No.	1
-	ASTM type flow table	No.	1
-	Curing box (60 x 40 x 60cm)	No.	1
-	Concrete consistency apparatus	No.	1
-	Mortar mixer	No.	1

15) Marshall Stability Test Equipment (AASHTO T 245)

-	Specimen mould including base plate and extension collar	No.	10
-	Specimen extractor	No.	1
-	Compaction hammer	No.	2
-	Compaction pedestal and specimen mould holder	No.	2
-	Breaking head mould	No.	1
-	CBR/Marshall motorised dual speed 60 kN load frame, ASTM	No.	1
-	Electrically operated laboratory mixer 10 litre capacity	No.	1
-	Flowmeter	No.	2
-	Suitable mechanical mixer	No.	1

- Water bath with cover at least 150mm deep thermostatically controlled to maintain the temperature of the water at 60 deg.C + - 1 deg.C. The tank shall have a perforated false bottom or be equipped with a shelf for supporting specimens 50mm above the bottom of the bath.	No.	2
- Isomantle electric heater for bowl of laboratory mixer	No.	1
- Thermometer with 50mm dia. and 180mm stainless steel stem (50 to 250 deg.C)	No.	1
- ASTM Marshall automatic compactor, electric	No.	1

16) Bitumen Extraction Test

(1) Extractor Bottle Method, B.S.598, Part 2

- Flat bottomed scoop	No.	2
- Steel garden trowel	No.	2
- Large steel spoon	No.	2
- Water resistant gloves	Pair	3
- Foot pump for pressurising air-water assemblies up to a maximum of 700kN/m^2 and fitted with flexible hose approximately 1.2m long and connector	No.	1
- Steel bottle 600ml capacity with 49mm rubber stopper	No.	1
- Steel bottle 2500ml capacity with 71mm rubber stopper	No.	1
- Steel bottle 7000ml capacity with 71mm rubber stopper	No.	1
- Flash funnel for fitting to the 700ml steel bottles. The rim of the funnel retains a sieve 200mm nominal diameter	No.	1
- Bottle roller - A compact bench mounted unit designed to rotate two bottles simultaneously about their longitudinal axis	No.	1
- Pressure filter complete with cutting tool for making a hole in the filter paper	No.	1
- Filter funnel to take 200mm nominal diameter sieves	No.	1
- Centrifuge complying with as BS 598	No.	1
- Binder recovery apparatus	No.	1
- Volumetric flask 250ml, 500ml, 1000ml and 2000ml capacity of each	No.	2
- Recovery still for Dichloromethane	No.	1

(2) Hot Extractor Methods, B.S. 598, Part 2

- Hot extractor complete with wire gauze container, gasket, cork lid and support assembly	No.	1
- Dean and Stark Receiver with condenser to suit Trichoroethylene	No.	1

17) **Consumables**

-	Paraffin wax	kg	50
-	Gas	kg	1,600
-	Gunny sack	No.	400
-	Plastic bag, 900 x 450mm x 1000 gauge	No.	2,000
-	Plastic bag, 450 x 300mm x 1000 gauge	No.	1,000
-	Filter paper 150mm dia., Whatman No.5 (Boxes of 100)	No.	10
-	Filter paper 400mm dia., Whatman No.5 (Boxes of 100)	No.	5
-	Filter paper 100mm dia., Whatman No.5 (Boxes of 100)	No.	5
-	Trichloroethylene (205 litre drum)	No.	2
-	Dichloromethane (275 kg drum)	No.	2
-	Cotton waste (or drying cloths)	kg	100
-	Filter paper 270mm dia., 33mm with dia. hole in centre, Whatman No.5 (Box of 100)	No.	15
-	Filter paper 400mm diameter Whatman No.54 (Box of 100)	No.	10
-	Registration paper for compaction test	sheets	1,000
-	Moisture-density relation test plot paper	sheets	1,000
-	Registration paper for Atterberg Limits	sheets	1,000
-	Registration paper for Particle size analysis	sheets	1,000
-	Registration paper for CBR	sheets	1,000
	Subtotal (Laboratory Equipment, Items 2 to 18)		
	Total (Item 1 to 18)		

SURVEY EQUIPMENT FOR THE ENGINEER

The Contractor shall provide and maintain in good repair for the duration of the Contract, the following survey equipment.

The survey equipment shall be made available in its entirety to the Engineer not later than two weeks after the Engineer's order to commence the Works and shall continue to be made available for the Engineer's exclusive use throughout the Contract Period.

-	Carl Zeiss N13 Automatic Engineers level c/w tripod or similar	No.	3
-	Carl Zeiss TH2 single second theodolite complete with tripod or similar	No.	2
-	Survey umbrellas	No.	2
-	4m Levelling staves with bubble and case	No.	5
-	2.5m Ranging rods	No.	20
-	1m Stainless steel straight edge	No.	2
-	3m aluminium straight edge	No.	3
-	30m steel white face tape	No.	3
-	100m steel band tape	No.	2
-	3m pocket tape	No.	15
-	Steel tape repair outfit	No.	1

The Contractor shall also make provision for the occasional use by the Engineer, as and when required, of any scheduled equipment during the Maintenance Period.

Any delays to the Contractor or the Contractor's activities caused by the Engineer being unable to perform survey work due to the Contractor's failure to supply the survey equipment in good time shall be deemed to be the Contractor's fault.

BILLS OF QUANTITIES

PREAMBLE TO THE BILLS OF QUANTITIES

1. The Bills of Quantities form part of the Contract Documents and are to be read in conjunction with the Conditions of Contract, Specifications and Drawings.

2. The quantities set forth in the Bills of Quantities are intended to represent the character of the work to be carried out. There is no guarantee to the Contractor that he will be required to carry out the quantities of work indicated under any one particular item or group of items in the Bills of Quantities, though on the Contract as a whole the Quantities are believed to represent the overall value of the work to be carried out.

3. The prices and rates inserted in the Bills of Quantities will be used for valuing the work executed and the Engineer will measure the whole of the Works executed in accordance with the Contract.

4. The prices and rates inserted in the Bills of Quantities are to be the full inclusive costs of the works described under the items, complete in place and in accordance with the Specifications, including costs and expenses which may be required in and for the construction of the works described, together with any temporary works and installations which may be necessary and all general risks, liabilities and obligations set forth or implied in the documents on which the Contract is based.

5. The brief description of the Items in the Bills of Quantities are purely for the purpose of identification and in no way modify or supersede the detailed description given in the Conditions of Contract or Standard Specification and Special Specification for the full directions and description of work and materials.

6. A price or unit rate is to be inserted, in ink against each Item in the Bills of Quantities whether quantities are stated or not. If a Tenderer omits to insert a price or unit rate for any item his tender may be disqualified.

7. No alteration shall be made to the Bills of Quantities and no extra item shall be inserted. The Tenderer shall satisfy himself that the Contract Sum arrived at by pricing the quantities and Items given is sufficient compensation for constructing and maintaining the whole of the Works in accordance with these Contract Documents.

8. The numbering of the bills is not consecutive, but is arranged to correspond to the sections in the Standard Specification.

9. Any costs which may be incurred by the Contractor in discharging his obligations under the Contract, and for which no separate specific items are provided in the Bills of Quantities, shall be deemed to have been distributed throughout the Contractor's rates and prices in the Bills of quantities.

10. Notwithstanding the descriptions of the methods of disbursement of Lump Sum prices, such payments shall be subject to withholding of retention money under the provisions of Clause 60(2) of the Conditions of Contract until the Limit of Retention Money is reached.

BILL OF QUANTITIES No.1
GENERAL

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
1.01	Provide, furnish and maintain the rented accommodation for the Engineer's Representative and his staff:					
	(1) Type I, 1 No.	Month	30			
	(2) Type II, 5 No.	Month	130			
	(3) Type III, 3 No.	Month	90			
	(4) Type IV, 5 No.	Month	150			
1.02	Provide, equip and maintain Main Office for the Engineer's Representative and his staff.	No.	1			
1.03	Provide and maintain laboratory for the Engineer's Representative and his staff.	No.	1			
1.04	Provide and maintain furniture and office equipment for the Engineer's office and Laboratory as listed in the Special Specification, all to the satisfaction of the Engineer.	Lump Sum				
1.05	Provide survey and laboratory equipment as listed in the Special Specification.	Lump Sum				
1.06	Provide with driver and maintain one (1) new 504 Peugeot or equivalent with a minimum engine capacity of 1800 cc approved by the Resident Engineer, inclusive of the first 3000 km travelled in any one month.	Veh. Month	30			
1.07	E.O.Item 1.06 for distance in excess of 3000 km travelled in any one month, inclusive of fuels, lubricants, tyres and additional servicing.	km	100,000			
	Carried forward to page 2					

BILL OF QUANTITIES No.1 (Cont)
GENERAL

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 1					
1.08	As for Item 1.06 but three (3) new LWB 4WD Land Rovers or equivalent with a minimum engine capacity of 2300 cc, inclusive of the first 3000 km travelled in any one month.	Veh. Month	90			
1.09	E.O.Item 1.08 for distance in excess of 3000 km travelled in any one month, inclusive of fuels, lubricants, tyres and additional servicing.	km	400,000			
1.10	As for Item 1.06 but three (3) new Subaru or equivalent with a minimum engine capacity of 1800 cc, inclusive of the first 3000 km travelled in any one month.	Veh. Month	90			
1.11	E.O.Item 1.10 for distance in excess of 3000 km travelled in any one month, inclusive of fuels, lubricants, tyres and additional servicing.	km	300,000			
1.12	Prime Cost Sum of Shs.22,100,000 for removals and alterations to following existing services;					
	(1) Telecommunication line	P.C. Sum			1,600,000	00
	(2) Electric lines	P.C. Sum			8,900,000	00
	(3) Water pipe lines	P.C. Sum			4,600,000	00
	(4) Railway	P.C. Sum			4,500,000	00
	(5) Sewerage pipe lines	P.C. Sum			1,600,000	00
	Carried forward to page 3					

BILL OF QUANTITIES No.1 (Cont)
GENERAL

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 2					
	(6) Existing street lighting	P.C. Sum			100,000	00
	(7) Electric fence of National Park	P.C. Sum			500,000	00
	(8) Fence of Kenya Rifles	P.C. Sum			300,000	00
1.13	Include percentage of P.C.Sum in Item 1.12 for Contractor's cost and profit.	% of Item 1.12				
1.14	Prime Cost Sum of Shs.3,000,000 for the compensation and aquisition of land.	P.C. Sum			3,000,000	00
1.15	Include percentage of P.C.Sum in Item 1.14 for Contractor's cost and profit.	% of Item 1.14				
1.16	Prime Cost Sum of Shs.600,000 for the Engineer's Miscellaneous Account.	P.C. Sum			600,000	00
1.17	Include percentage of P.C.Sum in Item1.16 for Contractor's cost and profit.	% of Item 1.16				
1.18	Provide and erect publicity signs as directed by the Engineer, all in accordance with MOPW DRG. NO.SS/234.	No.	10			
1.19	Prime Cost Sum of Shs 500,000 for rectification of title deeds.	P.C. Sum			500,000	00
1.20	Include percentage of P.C. Sum in Item 1.19 for Contractor's cost and profit.	% of Item 1.19				
	Sub-total carried forward to Summary on page 35					

BILL OF QUANTITIES No.4
SITE CLEARANCE AND TOPSOIL STRIPPING

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
4.01	Clear site in Open Country, including removal of trees, hedges, bushes and other vegetation or objectionable organic material, grub up roots and backfill to 95% MDD AASHTO T.99 with approved material all in accordance with the Specification.	ha	126			
4.02	As for Item 4.01 but to clear site in forest area.	ha	45			
4.03	Removal topsoil to a depth as directed by the Engineer and dispose of to spoil dump or stockpile for re-use as directed by the Engineer.	m3	106,790			
4.04	Scarify and remove to stockpile existing pavement material as directed by the Engineer.	m3	2,720			
4.05	Demolish existing railway bridge and remove debris to spoil over any distance, backfill voids and compact to 105% MDD as necessary.	Lump Sum				
4.06	Allow a Provisional Sum to be expended on a daywork basis for the removal of existing structures, fences and other obstructions.	Prov. Sum			500,000	00
	Sub-total carried forward to Summary on page 35					

BILL OF QUANTITIES No.5
EARTHWORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
5.01	Fill in soft material for main road and service road, and compact to at least 95% MDD AASHTO T.99.	m3	1,234,300			
5.02	As for Item 5.01 but for slip roads and approach roads.	m3	196,400			
5.03	As for Item 5.01 but hauling from drainage pond excavation works as shown on the Drawings.	m3	7,720			
5.04	As for Item 5.01 but for new railway embankment.	m3	5,480			
5.05	Fill in hard material for main road.	m3	104,900			
5.06	Fill in soft material for central reserves as shown on the Drawings.	m3	11,400			
5.07	Fill in soft material adjacent to shoulders as shown on the Drawings.	m3	3,310			
5.08	Spoil in unsuitable material such as black cotton and rubbish.	m3	189,500			
5.09	Spoil in soft material.	m3	5,000			
5.10	Spoil in hard material.	m3	1,000			
5.11	Overhaul earthworks in excess of 1.0 km free haul.	m3.km	3,432,300			
5.12	Excavation in swamps.	m3	1,000			
5.13	Provide and place rockfill in accordance with the Specification.	m3	1,000			
5.14	Compact original ground below fills to at least 95% MDD AASHTO T.99 including all necessary scarifying and watering as directed by the Engineer,to a depth of 150mm below ground level.	m3	62,600			
	Carried forward to page 6					

BILL OF QUANTITIES No.5
EARTHWORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 5					
5.15	E.O.Item 5.01 to 5.05 for compaction of 300mm subgrade material to at least 100% MDD AASHTO T.99 in Fill area.	m3	121,700			
5.16	Compact in-situ subgrade in Cut area to a depth of 300mm below formation level to at least 100% MDD AASHTO T.99.	m3	100,200			
5.17	Compact in-situ subgrade material in Cut area between 150mm and 300mm below underside of imported subgrade material to at least 95% MDD AASHTO T.99.	m3	1,000			
5.18	Compact in-situ subgrade material in Cut area between 0mm and 150mm below underside of imported subgrade material to at least 100% MDD AASHTO T.99.	m3	1,000			
5.19	Provide, place and compact improved subgrade material in locations where directed by the Engineer.	m3	1,000			
5.20	Rock formation levelling in Cut area below lean concrete base level or as directed by the Engineer.	m2	72,100			
5.21	Haul from stockpile and spread on side-slopes and central reserves, lightly roll and compact 75mm thickness of topsoil.	m2	335,700			
5.22	Haul from stockpile and spread on black cotton spoil area, lightly roll and compact 200mm thickness of topsoil in locations as directed by the Engineer.	m2	69,100			
	Carried forward to page 7					

BILL OF QUANTITIES No.5
EARTHWORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 6					
5.23	Haul from stockpile and spread on rubbish spoil area and side borrow area, and compact topsoil or as directed by the Engineer.	m3	15,400			
5.24	Plant fillslopes and cutslopes with selected grass in accordance with the Specification, including the establishment of plant nurseries where required.	m2	773,000			
5.25	Provide, place and compact filter material for drainage layer and sand mat in locations where directed by the Engineer.	m3	1,000			
5.26	Fill for new national park boundary dike including demolishing existing dike.	m3	58,300			
5.27	Filter Fabric under, over or around rockfill:	m2	1,000			
	Sub-total carried forward to Summary on page 35					

BILL OF QUANTITIES No.7
EXCAVATION AND FILLING FOR STRUCTURES

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	BRIDGES					
7.01	Excavation, compaction at foundation levels, backfilling and removal of excavated material to spoil for structures foundations in soft materials.	m3	5,330			
7.02	E.O.Item 7.01 at any location for excavation in hard materials.	m3	1,230			
7.03	Backfilling with selected material behind bridge abutment, wing walls and around structures.	m3	4,980			
7.04	Provide and place porous filter material behind bridge abutments and wing walls.	m3	300			
7.05	Provide and place selected granular fill material.	m3	200			
	BOX CULVERTS					
7.06	Excavation, compaction at foundation levels, backfilling and removal of excavated material to spoil for structures foundations in soft materials.	m3	15,680			
7.07	E.O.Item 7.06 at any location for excavation in hard materials.	m3	300			
7.08	Backfilling with selected material behind box culvert walls and around structures.	m3	22,670			
7.09	Provide and place porous filter material behind box culvert walls.	m3	1,990			
7.10	Provide and place selected granular fill material.	m3	1,420			
	Carried forward to page 9					

BILL OF QUANTITIES No.7
EXCAVATION AND FILLING FOR STRUCTURES

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 8					
7.11	Excavation and backfilling for gabions in soft material.	m3	275			
7.12	Provide, fabricate and place gabion mesh containers as shown on the drawings or as directed by the Engieer.	m2	550			
7.13	Provide and place rockfill to gabions.	m3	275			
	Sub-total carried forward to Summary on page 35					

BILL OF QUANTITIES No.8
CULVERTS AND DRAINAGE WORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	NOTE: No separate payment shall be made for the haulage of surplus or unsuitable excavated material and the cost of such haulage shall be included in the rates and prices.					
8.01	Excavate in soft material for pipe culverts below existing ground level or road formation level including support of trench sides, backfilling and compaction at least 95% MDD AASHTO T.99 up to new road formation level or ground level whichever is the lower, dewatering,and carting surplus material to spoil dump.	m3	3,970			
8.02	As for Item 8.01 but for inlets and outlets of culverts.	m3	2,970			
8.03	Excavate in soft material for earth channel, drain type I.	m3	5,650			
8.04	Excavate in soft material for stone pitching channel, drain type II.	m3	3,900			
8.05	Excavate in soft material for concrete channel, drain type III.	m3	3,690			
8.06	Excavate in soft material for concrete channel with cascade, drain type VII.	m3	5,600			
8.07	Excavate and backfill for gulley pots in soft material.	m3	180			
8.08	Excavate and backfill for concrete ditch type VI, in soft material.	m3	540			
8.09	Excavate and backfill for gabions in soft material.	m3	580			
8.10	Excavate for subsoil drains in soft material.	m3	460			
	Carried forward to page 11					

BILL OF QUANTITIES No.8
CULVERTS AND DRAINAGE WORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Carried forward from page 10					
8.11	E.O.Item 8.01 to 8.10 at any location for excavation in hard materials.	m3	500			
8.12	Provide and place 140 g/m2 filter fabric to subsoil drains.	m2	3,040			
8.13	Provide and place crushed rock backfill to subsoil drains.	m3	420			
8.14	Provide and place perforated 200mm dia. PVC pipe to subsoil drains.	m	1,265			
8.15	Provide, lay and joint 300mm I.D. concrete pipes ogee jointed.	m	155			
8.16	As for Item 8.15 but 600mm I.D.	m	1,031			
8.17	As for Item 8.15 but 750mm I.D.	m	90			
8.18	As for Item 8.15 but 900mm I.D.	m	1,067			
8.19	As for Item 8.15 but 1200mm I.D.	m	294			
8.20	Provide, place and compact class 15/20, concrete bed and surround to concrete pipes, including formwork.	m3	2,520			
8.21	As for Item 8.20 but concrete facing for drain ditch on berm, drain type VIII.	m2	1,280			
8.22	Provide, place and compact class 25/20 concrete for headwalls, wingwalls, aprons and toewalls to pipe culverts including all formwork and provision and placing of fabric mesh reinforcement as shown on the Drawings.	m3	924			
8.23	As for Item 8.22 but class 15/20 for concrete channel, drain types III and VII.	m3	1,330			
	Carried forward to page 12					

BILL OF QUANTITIES No.8
CULVERTS AND DRAINAGE WORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 11					
8.24	Provide, place and compact class 20/20 concrete for concrete ditch, drain type VI including all formwork and placing of reinforcement as shown in the Drawings.	m3	94			
8.25	Provide, place and compact class 20/20 concrete for in-situ gulley pots including all formwork.	m3	63			
8.26	As for Item 8.24 but concrete cover of gulley pot.	No.	168			
8.27	Provide and place 50mm dia. PVC weep holes.	No.	45			
8.28	Excavate as necessary, provide all materials and construct 150mm thick grouted stone pitching to bed and side-slopes of drains, ditches, channels, groundfaces, inlets and outlets of culverts, including carting of excavated material to spoil, as directed by the Engineer.	m2	26,090			
8.29	As for Item 8.28 but 250mm building stone at concrete channel with cascade.	m2	1,730			
8.30	Cement rendering on building stone.	m2	1,730			
8.31	Provide fabricate and place gabion mesh, 1m thick, as shown on the Drawings or directed by the Engineer.	m2	430			
8.32	Provide and place mattresses, 0.3m thick, as shown on Drawings or directed by the Engineer.	m2	467			
8.33	Provide and place rockfill to gabions and mattresses.	m3	570			
	Carried forward to page 13					

BILL OF QUANTITIES No.8
CULVERTS AND DRAINAGE WORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 12					
8.34	Provide and place filter fabric under and/or behind gabions.	m2	335			
8.35	Excavate trench, provide, lay and joint 450 x 225mm P.C.C. invert block drains (I.B.D.)having 300mm dia. channel.	m	507			
8.36	Provide and lay 75mm thick P.C.C. side slabs to I.B.D.Channel.	m2	477			
8.37	Excavate trench, provide, lay and joint 375 x 250mm P.C.C.invert block drain, drain type IV.	m	15,440			
8.38	As for Item 8.37 but for on berm, drain type VIII.	m	740			
8.39	Excavate, provide all materials and construct kerb inlet at busbays as detailed on the Drawings.	No	32			
8.40	Excavate, provide all materials and construct intake block channel at busbays as detailed on the Drawings.	No	32			
8.41	Provide and place concrete class 15 for 250 x 150mm in-situ gutters.	m	48			
8.42	Provide and place selected granular fill material for gravel bedding.	m3	79			
8.43	Plant channel slopes with selected grass in accordance with the Specification.	m2	11,330			
8.44	Earth dike of drainage pond.	m3	710			
	Sub-total carried forward to Summary on page 35					

BILL OF QUANTITIES No.9
PASSAGE OF TRAFFIC

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
9.01	Provide and maintain signs and barriers in locations as directed by the Engineer.	km	19			
9.02	Construct and maintain 7.0m wide deviations including drainage, pavement type Deviation-1(Mombasa Road Junction).	km	1			
9.03	As for Item 9.02 but pavement type Deviation-1(Uhuru Monument Junction).	km	1			
9.04	As for Item 9.02 but pavement type Deviation-2(Ngong Road Junction and Dagoretti Forest Junction).	km	1			
9.05	Construct and maintain 6.0m wide deviations including drainage,pavement type Deviation-3.	km	1			
9.06	Construct and maintain 3.0m wide deviations including drainage, pavement type Deviation-4.	km	3			
9.07	Reinstatement of deviations and existing drainages.	Lump Sum				
9.08	Reinstatement of existing road after completion of cross-drainage works, Mombasa Road Junction.	m2	70			
9.09	Reinstatement of existing road after completion of cross-drainage works, Kikuyu Junction.	m2	35			
9.10	Maintenance of the project road (main road, slip road, approach road and service road) used for the deviation purpose as specified.	Lump Sum				
9.11	Improvement of the existing road as instructed and approved by the Engineer.					
	(1) Improvement of subgrade material.	m3	100			
	Carried forward to page 15					

BILL OF QUANTITIES No.9
PASSAGE OF TRAFFIC

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 14					
9.12	Maintenance of Existing Roads used for heavy construction traffic as specified when and where directed by the Engineer.	km	30			
9.13	Re-carpeting of Existing Roads 6m wide or pro rata as specified when and where directed by the Engineer	m3	1,800			
	(2) Gravel wearing course.	m3	600			
	(3) Graded crushed stone base.	m3	50			
	(4) MC 3000 first seal coat at 0.6 l/m2	litre	150			
	(5) Chippings, 3/6mm.	m3	2			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.10
GRAVEL WEARING COURSE

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
10.01	Clear site of the material site.	ha	1			
10.02	Construct access road to the material site in excess of 200m in length.	km	1			
10.03	Excavate and spoil topsoil and over-burden in the material site.	m3	4,000			
10.04	Excavate gravel wearing course material, transport, spread and compact to at least 95% MDD AASHTO T.180 for service roads.	m3	4,320			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.13
GRADED CRUSHED STONE FOR SUBBASE AND BASE

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
13.01	Provide,spread and compact graded crushed stone to subbase for main road.	m3	84,490			
13.02	As for Item 13.01 but for slip road.	m3	14,020			
13.03	As for Item 13.04 but for approach road and service road.	m3	3,030			
13.04	Provide,spread and compact graded crushed stone to base for slip road, approach road and service roads.	m3	2,150			
13.05	Provide,spread and compact graded crushed stone to shoulders for main road.	m3	43,810			
13.06	As for Item 13.05 but for slip road.	m3	6,360			
13.07	As for Item 13.05 but for approach road and service road.	m3	1,000			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.14A
LEAN CONCRETE FOR BASE

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
14A/1	Provide, process, mix, transport, spread and compact lean concrete base material for main road at 4% nominal cement content by weight of total mix.	m3	90,340			
14A/2	As for Item 14A/1 but for slip road.	m3	11,150			
14A/3	As for Item 14A/1 but for approach road.	m3	1,020			
14A/4	Protecting and curing lean concrete base.	m2	515,500			
14A/5	Variation in cement content (Provisional).	tonne	200			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.15
BITUMINOUS SURFACE TREATMENT AND SURFACE DRESSING

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	NOTE: No haulage will be paid for bitumen or chippings and this shall be included in the following rates and prices.					
	PRIME COAT					
15.01	Prepare surface of base, provide, transport, heat as specified and spray MC 3000 prime coat at at a nominal spray rate of 1.0 litre/m2 for main road.	litre	411,550			
15.02	As for Item 15.01 but for slip road.	litre	55,740			
15.03	As for Item 15.01 but for approach road.	litre	4,600			
	TACK COAT					
15.04	Prepare surface of binder course, provide, transport, heat as specified and spray MC 3000 cut-back bitumen tack coat at nominal spray rate of 0.6 litre/m2 for main road.	litre	493,860			
15.05	As for Item 15.04 but for slip road.	litre	44,220			
15.06	As for Item 15.04 but for approach road.	litre	5,520			
	SURFACE DRESSING (Double Surface Dressing)					
15.07	Provide, heat and spray MC 3000 cut-back bitumen at a nominal spray rate of 1.3 litres/m2 as first seal coat.	litre	209,610			
15.08	As for Item 15.07 but at a nominal rate of 0.3 litre/m2 as second seal coat.	litre	48,370			
	Carried forward to page 20					

BILL OF QUANTITIES No.15
BITUMINOUS SURFACE TREATMENT AND SURFACE DRESSING

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 19					
15.09	Provide, transport,lay and roll 10/14mm chippings at a rate of 69 m2/m3.	m3	2,340			
15.10	As for Item 15.09 but 3/6mm chippings at a rate of 250 m2/m3. (Single Surface Dressing)	m3	645			
15.11	Provide, heat and spray MC 3000 cut-back bitumen at a nominal spray rate of 0.6 litres/m2.	litre	3,170			
15.12	Provide, transport,lay and roll 3/6mm chippings at a rate of 189 m2/m3.	m3	28			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.16
BITUMINOUS BINDER COURSE AND WEARING COURSE

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	NOTE: No haulage shall be paid for in respect of any of the items or materials contained in this Bill of Quantities and the cost of such haulage shall be deemed to be included in the rates entered below.					
16.01	Provide, lay and compact Asphalt Concrete Binder Course using 5.5% nominal bitumen content by weight of total mix for main road.	m3	32,930			
16.02	As for Item 16.01 but for slip road.	m3	3,430			
16.03	As for Item 16.01 but for approach road.	m3	460			
16.04	Provide, lay and compact Asphalt Concrete Wearing Course using 6.5% nominal bitumen content by weight of total mix for main road.	m3	16,460			
16.05	As for Item 16.04 but for slip road.	m3	2,230			
16.06	As for Item 16.04 but for approach road.	m3	230			
16.07	80/100 penetration bitumen binder variation.	litre	Rate only			
16.08	Supply and mix in different active mineral filler as directed by the Engineer.	tonne	100			
16.09	As for Item 16.08 but to inert mineral filler.	tonne	50			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.17
CONCRETE WORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	BRIDGES					
	Concrete:					
	Provide, place and compact the following classes of concrete for insitu works as specified.					
17.01	Class 15/40 for blinding concrete on all structures.	m3	180			
17.02	Class 25/20 for structural concrete in:					
	(1) Bridges for Mombasa Road Junction, Uhuru Monument Junction and Railway.	m3	2,880			
	(2) Vehicle bridges.	m3	1,090			
	(3) Pedestrian bridges.	m3	90			
17.03	Class 30/20 for structural concrete.	m3	2,120			
17.04	Provide UF2 finish to concrete surface.	m2	5,830			
	Formwork:					
	Provide,erect and afterwards dismantle and remove the Items specified below:					
17.05	Formwork to achieve class F1 finish:					
	(1) Sloping	m2	86			
	(2) Vertical	m2	2,660			
17.06	Formwork to achieve class F2 finish:					
	(1) Horizontal	m2	3,450			
	(2) Sloping	m2	218			
	(3) Vertical	m2	9,050			
	Carried forward to page 23					

BILL OF QUANTITIES No.17
CONCRETE WORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 22					
17.07	Provide and fix in position high tensile steel reinforcement bars to BS 4461 of diameter equal to or less than 16mm.	tonne	202			
17.08	As for Item 17.07 but of diameter greater than 16mm.	tonne	482			
17.09	Provide and place 200mm wide waterstops as specified in the Drawings.	m	57			
17.10	Provide and place 20mm thick joint filler	m2	36			
	BOX CULVERTS					
	Concrete:					
	Provide, place and compact the following classes of concrete for insitu works as specified.					
17.11	Class 15/40 for blinding concrete on all structures.	m3	588			
17.12	Class 25/20 for structural concrete.					
	(1) Box culverts for road.	m3	7,820			
	(2) Box culverts for drainage.	m3	6,320			
	(3) Box culverts for footpath.	m3	646			
17.13	Provide UF2 finish to concrete surface.	m2	9,880			
	Formwork:					
	Provide, erect and afterwards dismantle and remove the Items specified below:					
	Carried forward to page 24					

BILL OF QUANTITIES No.17
CONCRETE WORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 23					
17.14	Formwork to achieve class F1 finish:					
	(1) Vertical	m2	12,120			
17.15	Formwork to achieve class F2 finish:					
	(1) Horizontal	m2	4,000			
	(2) Vertical	m2	7,450			
17.16	Provide and fix in position high tensile steel reinforcement bars to BS 4461 of diameter equal to or less than 16mm.	tonne	215			
17.17	As for Item 17.16 but of diameter greater than 16mm.	tonne	1,225			
17.18	Provide and place 200mm wide waterstops as specified in the Drawings.	m	909			
17.19	Provide and place 20mm thick joint filler	m2	712			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.20
ROAD FURNITURE

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
20.01	Provide and erect standard warning signs:					
	(1) Type W28,1200mm	No.	30			
	(2) Type W29,1200mm	No.	22			
	(3) Type W36,1200mm	No.	3			
	(4) Type W37,1200mm	No.	22			
20.02	Provide and erect standard priority signs:					
	(1) Type R1,1200mm	No.	10			
20.03	Provide and erect standard prohibitory signs:					
	(1) Type P1,1000mm	No.	1			
	(2) Type P25,1000mm	No.	30			
20.04	Provide and erect standard mandatory signs:					
	(1) Type M3,1000mm	No.	1			
	(2) Type M4,1000mm	No.	1			
20.05	Provide and erect non-standard informatory signs (advance direction signs, direction signs, route confirmatory signs):					
	(1) less than 1m2	No.	55			
	(2) 3m2-4m2	No.	1			
	(3) 4m2-5m2	No.	8			
	(4) 5m2-6m2	No.	10			
	(5) 6m2-7m2	No.	1			
	(6) 7m2-8m2	No.	12			
	(7) 8m2-9m2	No.	7			
	(8) 9m2-10m2	No.	1			
20.06	Road marking in yellow or white paint.	m2	3,430			
	Carried forward to page 26					

BILL OF QUANTITIES No.20
ROAD FURNITURE

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 25					
20.07	Provide and fix flex beam guardrails, all in accordance with the Drawings.	m	8,590			
20.08	Provide and erect road edge marker post.	No.	87			
20.09	Provide and erect road reserve boundary post where directed by the Engineer.	No.	230			
20.10	Plant selected grasses in the central reserves, including the establishment of plant nurseries where required.	m2	32,000			
20.11	Plant selected shrubs and bushes approved by the Engineer at locations in the central reserve and road reserve boundary, including the establishment of plant nurseries where required.	No.	8,120			
20.12	As for Item 20.11 but selected trees.	No.	226			
20.13	Provide and erect kilometer posts as directed by the Engineer.	No.	58			
20.14	Provide and lay flush kerb,150 x 100mm, Type A	m	119,160			
20.15	Provide and lay flush kerb,150mm x 80mm, Type B.	m	6,380			
20.16	Provide and lay flush kerb,150mm x 80mm, Type C.	m	3,300			
20.17	Provide and lay flush kerb,150mm x 80mm, Type D.	m	3,900			
20.18	Provide and lay flush kerb,150mm x 80mm, Type E.	m	1,300			
	Carried forward to page 27					

BILL OF QUANTITIES No.20
ROAD FURNITURE

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 26					
20.19	Quardrant for flush kerb, main road and slip road:					
	(1) In-situ 0.5m radius,Type A.	No.	25			
	(2) In-situ 0.5m radius,Type B.	No.	4			
20.20	Provide and lay raised kerb,125mm x 250mm, slip road.					
	(1) straight.	m	1,530			
	(2) radius 5m to 1m.	m	72			
20.21	Provide and lay raised kerb,125mm x 250mm, main road.					
	(1) straight.	m	256			
	(2) radius 5m to 1m.	m	114			
20.22	Provide and lay ramped kerb.	No.	64			
20.23	Provide and erect permanent five strand wire fencing including intermediate and straining posts in areas specifically directed by the Engineer.	m	1,500			
20.24	Provide and erect gates as directed and approved by the Engineer.	No.	8			
20.25	Provide and erect double headed guardrail, all in accordance with the Drawings.	m	3,660			
20.26	Provide stairways for bus stops as specified in the Drawings.	m	53			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.21
MISCELLANEOUS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
21.01	Supply and apply, in accordance to manufacturer's instructions waterproofing materials to top of bridge decks, approach slabs and all structural concrete surfaces in contact with fill material prior to backfilling.	m2	20,050			
21.02	Supply and install in position elastomeric bearings including mortar mortar plinth, fixed,					
	(1) 406 x 279 x 18mm	No.	12			
	(2) 432 x 203 x18mm	No.	37			
21.03	Supply and install in position elastomeric bearings including mortar plinth, movable:					
	(1) 229 x 152 x 56mm	No.	8			
	(2) 279 x 229 x 37mm	No.	16			
	(3) 279 x 229 x 46mm	No.	22			
	(4) 279 x 229 x 65mm	No.	18			
	(5) 432 x 203 x 65mm	No.	12			
21.04	Supply and install joint filler for expansion joint:					
	(1) 30mm thick.	m2	69			
	(2) 25mm thick.	m2	82			
	(3) 20mm thick.	m2	23			
21.05	Supply and install sealant for expansion joint:					
	(1) 30 x 50mm deep.	m	66			
	(2) 25 x 50mm deep.	m	75			
21.06	Provide, lay and compact Asphalt Concrete Wearing Course for bridge decks.	m3	134			
21.07	Supply and install flex beam guardrails including post for vehicle bridge as detailed on the Drawings.	m	244			
	Carried forward to page 29					

BILL OF QUANTITIES No.21
MISCELLANEOUS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 28					
21.08	Provide and erect in position parapet handrails to railway bridge as detailed on the Drawings.	m	114			
21.09	Provide and erect in position pedestrian parapets to footbridges as detailed on the Drawings.	m	282			
21.10	Provide and install 100mm dia.drain pipe through deck slabs.	No.	36			
21.11	Provide and place 75mm dia.PVC weep holes.	No.	62			
21.12	Provide and place 200mm dia.perforated PVC pipes.	m	1,770			
21.13	Provide and install 20mm dia. dowel bars with caps as specified on the Drawings.	No.	152			
21.14	As for Item 21.13 but 40mm dia.	No.	98			
21.15	Provide, spread and compact graded crushed stone to base for road box culverts.	m3	132			
21.16	Provide, lay and compact Asphalt Concrete Wearing Course for road box culverts.	m3	142			
21.17	Provide and place 200mm dia.PVC weep holes from behind the abutments.	No.	30			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.22
DAYWORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	NOTE: PLANT The rate inserted herein are to include all operational and maintenance cost, fuel, oil, grease, drivers and turnboys, wages, supervision, overheads and profits. Only time actually employed upon the works will be paid for and the rates should include for idle time, travelling and overtime. All items of plant must be priced. Items of Major Plant Employed on Dayworks. Where items of major plant listed in the Schedule of Dayworks are specified by type (e.g. D-6,D-8,CAT.14,ets.)the power ratings shall not be lower than the power ratings of such plant manufactured within the two years prior to the date of tender. Any items of major plant employed upon Dayworks which has a power rating lower than that specified above, shall be paid for at rates lower than those in the Schedule of Dayworks. The reduction in the rate payable shall be in proportion to the reduction in power rating below that specified above.					
22.01	D6 tractor or equivalent,including brade and ripper.	hr	200			
22.02	D7 tractor or equivalent,including brade and ripper.	hr	200			
22.03	D8 tractor or equivalent,including brade and ripper.	hr	100			
22.04	Motor grader CAT140G or equivalent (complete with scarifier).	hr	300			
22.05	Heavy grid or sheepsfoot roller.	hr	100			
	Carried forward to page 31					

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 30					
22.06	Vibrating roller,10 ton.	hr	100			
22.07	15 ton pneumatic self-propelled roller.	hr	100			
22.08	16-18 ton smooth wheel roller.	hr	100			
22.09	As for Item 22.08 but 6-8 ton.	hr	100			
22.10	Small hand-propelled vibrating roller.	hr	200			
22.11	Rammer and/or compactor.	hr	300			
22.12	1.6 m3 class tractor shovel or equivalent.	hr	200			
22.13	2.3 m3 tractor shovel or equivalent.	hr	100			
22.14	0.7 m3 class mechanical excavator (backhoe) or equivalent.	hr	100			
22.15	0.3 m3 class mechanical excavator (backhoe) or equivalent.	hr	200			
22.16	2.3 m3 class wheel loader or equivalent.	hr	200			
22.17	3 m3 class wheel loader or equivalent.	hr	100			
22.18	6 ton tipper lorry.	hr	300			
22.19	10 ton tipper lorry.	hr	300			
22.20	6 ton lorry.	hr	300			
22.21	10 ton lorry.	hr	300			
22.22	0.7 to 1 ton pick up car.	hr	200			
22.23	Land Rover.	hr	200			
22.24	6 m3/min air compressor.	hr	100			
22.25	10 m3/min air compressor.	hr	100			
22.26	50mm delivery water pump and moter.	hr	200			
	Carried forward to page 32					

BILL OF QUANTITIES No.22
DAYWORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 31					
22.27	As for item 22.26 but 75mm.	hr	200			
22.28	Concrete mixer 14/10.	hr	100			
22.29	Concrete vibrator,poker type.	hr	100			
22.30	Self-propelled water tanker 9500 litre.	hr	200			
22.31	Pressure bitumen distributor 4500 litre.	hr	100			
22.32	Lorry for Benkelman beam & plate bearing Tests.	hr	300			
	LABOR The rates inserted herein are to include all costs of labor such as insurance, accommodation, travelling time, use and maintenance of small tools of the trade, supervision,overheads and profit. Only the actual time engaged upon the works will be paid for.					
22.33	Unskilled labor	hr	50,000			
22.34	Working ganger	hr	10,000			
22.35	Artisans	hr	10,000			
	MATERIALS All materials are to comply with the Specifications. The rates inserted herein are to include for delivery to the site, storage, handling, overheads and profit.					
22.36	Ordinary Portland Cement.	tonne	40			
22.37	Mild steel (any diameter).	tonne	3			
	Carried forward to page 33					

BILL OF QUANTITIES No.22
DAYWORKS

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 32					
22.38	High yield steel (any diameter).	tonne	3			
22.39	Fine aggregate for concrete.	m3	200			
22.40	Coarse aggregate for concrete,maximum size 20mm.	m3	100			
22.41	Coarse aggregate for concrete,maximum size 40mm.	m3	100			
22.42	Graded crushed stone for subbase and base.	m3	100			
22.43	Wrought shuttering timber.	m2	100			
22.44	Unwrought shuttering timber.	m2	100			
22.45	Timbering for trenches.	m2	100			
22.46	Cut back bitumen,Grade MC 30.	litre	1,000			
22.47	Cut back bitumen,Grade MC 3000.	litre	1,000			
22.48	Emulsion, KI-60	litre	1,000			
22.48	Straight-run bitumen,Grade 80/100.	litre	1,000			
22.49	10/14mm nominal size chippings.	m3	200			
22.50	3/6mm nominal size chippings.	m3	200			
	Carried forward to Summary on page 35					

BILL OF QUANTITIES No.23
PILING

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
23.01	Mobilization of all the necessary plant for the piling operation,setting up on the position of the first pile and removal on completion of the last pile.	L.S.				
23.02	Move and set up each pile position.	No.	96			
23.03	Supply of steel pipe piles 500 mm dia., 9 mm thick.	m	816			
23.04	Driving piles of 500 mm dia.including positioning and pitching.Include for cutting pile heads to correct level, and filling with concrete.	m	816			
	Carried forward to Summary on page 35					

SUMMARY OF BILLS OF QUANTITIES

Bill No.	Description	Amount Shillings	Cts
1	General		
4	Site Clearance and Topsoil Stripping		
5	Earthworks		
7	Excavation and Filling for Structures		
8	Culverts and Drainage Works		
9	Passage of Traffic		
10	Gravel Wearing Course		
13	Graded Crushed Stone Subbase and Base		
14A	Lean Concrete		
15	Bituminous Surface Treatment and Surface Dressing		
16	Bituminous Binder Course and Wearing Course		
17	Concrete Works		
20	Road Furniture		
21	Miscellaneous		
22	Dayworks		
23	Piling		
	Total		

APPENDIX TO BILL OF QUANTITIES
ITEM 1.04 - FURNITURE AND OFFICE EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
1.04	**Provide and maintain furniture and office equipment for the Engineer's office and laboratory as listed in the Special Specification, all to the satisfaction of the 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 benches.	No.	6			
	Carried forward to page 37					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.04 - FURNITURE AND OFFICE EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 36					
2.	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.	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			
	Carried forward to page 38					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.04 - FURNITURE AND OFFICE EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 37					
	- 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 (Staedtler).	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 paper.	No.	1			
	Carried forward to page 39					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.04 - FURNITURE AND OFFICE EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 38					
	- Electronic scientific calculator, 12 figures.	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 invluding parallel cable(2m) and 20 spare ribbons.	No.	1			
	- Desk-top photocopying machine A3/A4 size, reduction and enlargement facilities.	No.	1			
	Total to Item 1.04 on page 1					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
1.05	**Provide survey and laboratory equipment as listed in the Special Specification.**					
1. Survey Equipment						
	- Carl Zeiss NI3 Automatic Engineers level c/w tripod or similar.	No.	3			
	- Carl Zeiss TH2 single second theodolite complete with tripod or similar.	No.	2			
	- Survey umbrellas.	No.	2			
	- 4m Levelling staves with bubble and case.	No.	5			
	- 2.5m Ranging rods.	No.	20			
	- 1m Stainless steel straight edge.	No.	2			
	- 3m aluminium straight edge.	No.	3			
	- 30m steel white face tape.	No.	3			
	- 100m steel band tape.	No.	2			
	- 3m pocket tape.	No.	15			
	- Steel tape repair outfit.	No.	1			
	Subtotal (item 1, Survey Equipment)					
	NOTE: The following equipment shall be purpose made for use in soils testing laboratory and shall comply with the relevant British (BS) or American (AASHTO) Standard.					
2. Compaction Test (AASHTO T.99 and T.180)						
	- Compaction mould complete with base plate extension collar,101.6mm internal diameter x 116.43mm high.	No.	10			
	Carried forward to page 41					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 40					
	- 2.495kg compaction hammer, drop regulated to 304.8mm.	No.	5			
	- 4.536kg compaction hammer, drop regulated to 457.2mm.	No.	5			
	- Aggregate compaction mould to BS.5835 complete.	No.	10			
	- Loading frame for the Kango hammer (to BS.5835).	No.	1			
	- Electric vibrating Kango hammer with steel tamper.	No.	1			
	- Steel straight edge 300mm long x 25mm wide x 3mm thick.	No.	6			
	- Compaction mould 152.4mm dia.x 116.43mm high complete with base plate and extension collar.	No.	10			
3.	Density Test (Sand replacement method BS 1377)					
	- Galvanized metal tray 1m x 0.5m x 75mm deep.	No.	2			
	- 75mm brush.	No.	6			
	- Semi-automatic balance, 25kg capacity, accurate to 1g, including weights.	No.	2			
	- Metal containers, 450mm dia.	No.	6			
	- Stainless steel tray, 305mm dia.	No.	3			
	- Metal tray with 100mm diameter hole in the centre, 300mm x 300mm square.	No.	3			
	- Metal tray with 150mm diameter hole in the centre, 300mm x 300mm square.	No.	3			
	- Metal tray with 200mm diameter hole in the centre, 457mm x 457mm square.	No.	3			
	- Steel pegs for fixing tray in position.	No.	36			
	Carried forward to page 42					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 41					
	- Sand pouring cylinder, 100mm diameter.	No.	3			
	- Sand pouring cylinder, 150mm diameter.	No.	3			
	- Sand pouring cylinder, 200mm diameter.	No.	3			
	- Cold steel chisel, 25mm x 300mm long.	No.	6			
	- Cold steel chisel, 10mm x 250mm long.	No.	6			
	- 1.8kg hammer.	No.	6			
	- Scoop for removing excavated material from hole, 250mm long handle.	No.	6			
	- 100mm brush, soft.	No.	6			
	- Metal dibber	No.	6			
	- Scraper	No.	6			
	- Steel pointed rod	No.	6			
	- Density spoon	No.	6			
	- 50mm brush, soft.	No.	6			
	- Calibrating can,100mm diameter x 150mm deep.	No.	3			
	- Calibrating can, 150mm diameter x 200mm deep.	No.	3			
	- Calibrating can, 200mm diameter x 250mm deep.	No.	3			
	- Polythene container jars, with neck 125mm diameter and 4 litre capacity.	No.	6			
	- Standard sand 600/300 micron, 50kg bag.	No.	10			
4.	Density(Nuclear Density Method, AASHTO T238)					
	- Nuclear moisture/density guage (Troxler 3411B or similar approved).	No.	1			
	Carried forward to page 43					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 42					
	- Hole forming device.	No.	1			
	- Guide for the above.	No.	1			
5.	Atterberg Limits Apparatus to BS 1377					
	- Casagrande liquid limit apparatus.	No.	4			
	- Grooving tool.	No.	4			
	- Liquid limit penetrometer.	No.	2			
	- Penetration test cone.	No.	2			
	- Penetration sample cap.	No.	2			
	- Linear shrinkage mould.	No.	20			
	- Vernier caliper, 150mm x 0.1mm.	No.	2			
	- Stainless steel, 3mm dia.and 100mm long.	No.	4			
6.	Sand Equivalent					
	- Sand equivalent test set.	Set	2			
7.	Specific Gravity (BS.1377 and BS.812) and Water Absorption (ASTM D 2041 - 78)					
	- Pycnometer for sands and fine aggregate, 1kg capacity, complete with cone and rubber seal.	No.	10			
	Carried forward to page 44					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 43					
	– Glass plastic or metal bowl having a capacity of at least 1000 ml strong enough to withstnd a full vacuum complete with cover fitted with rubber gasket and a hose connection.	No	10			
	– Volumetric flask having a capacity of at least 1000 ml strong enough to withstand a full vacuum complete with rubber stopper and a hose connection.	No.	10			
	– An intermediate size heavy wall glass pycnometer having a capacity of at least 10,000 ml complete with a suitable vacuum connection assembly consisting of a vacuum gauge, relief valve, and a tubing connector, plus a tapered stopper device for maintaining constant volume regulation.	No.	10			
	– A manometer or vacuum gauge suitable for measuring the specified vacuum.	No	1			
	- Gay Lussac-specific gravity bottle,25ml.	No.	10			
	- Gay Lussac-specific gravity bottle,50ml.	No.	10			
	- Wire mesh basket with apertures not greater than 6.5mm large enough to take 2.5 kg of aggregate.	No.	1			
	- Stout watertight container in which the basket can be freely suspended under water.	No.	1			
	- End-over-end shaker	No.	1			
	- Gas jar, 300mm high x 75mm dia. with glass plate and rubber stopper.	No.	10			
	Carried forward to page 45					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 44					
	- Vacuum type dessicator, 200mm dia.	No.	2			
	- Vacuum pump, 1 HP, capable of evacuating air from the container to a pressure of 30 mm Hg (4.0 kPA) or less.	No.	1			
	- Rubber headed pestel	No.	2			
	- Soft absorbent cloth (tea towel).	No.	20			
	- Shallow tray of area not less than 0.065m2.	No.	2			
	- Airtight container of similar capacity to the basket.	No.	1			
	- 5kg balance accurate to 0.1g capable of suspending the basket plus sample in the watertight container.	No.	1			
	- Hair drier	No.	1			
	- Sand absorption cone and tamper	No.	2			
	- Pycnometer for the above.	No.	2			
8.	Flakiness Index (BS.812)					
	- Flakiness sieve, 4.9 x 30mm slot.	No.	2			
	- Flakiness sieve, 7.2 x 40mm slot.	No.	2			
	- Flakiness sieve, 10.2 x 50mm slot.	No.	2			
	- Flakiness sieve, 14.4 x 60mm slot.	No.	2			
	- Flakiness sieve, 19.7 x 80mm slot.	No.	2			
	- Flakiness sieve, 26.3 x 90mm slot.	No.	2			
	- Flakiness sieve, 33.9 x 100mm slot.	No.	2			
	Carried forward to page 46					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 45					
9.	Sieve Analysis (BS.1377)					
	- BS sieve 300mm diameter in sizes 75,63, 50, 37.5, 28, 20, 14, 6.3, 5 and 3.35mm plus lid and receiver.	Set	4			
	- BS sieve 200mm diameter in sizes 2,1.18, 0.6, 0.425, 0.300, 0.212, 0.150, 0.075 and 0.063mm plus lid and receiver.	Set	4			
	- Electric sieve shaker.	No.	1			
	- BS sieve 200mm diameter, 0.425 and 0.075mm.	Set	10			
	- Field rocker sieve set.	Set	4			
10.	CBR Test (AASHTO T.193)					
	- CBR mould,152mm dia. x 178mm high, complete with perforated base plate and extension collar 50.8mm high that can be fitted to either end of the mould.	No.	30			
	- Spacer disk.	No.	6			
	- Perforated swell plate with adjustable centre post of rust prooted steel provided with a lock nut.	No.	6			
	- Sliding weight rammer, 2.49kg.	No.	3			
	- 2.27kg annular surcharge weight.	No.	30			
	- Static compaction press, 50 tonnes capa. with an adjustable platten speed between 1mm/min. and 50.8mm/min.(Hydraulic or mechanical operation and hand operated).	No.	1			
	- Set of guards.	No.	1			
	- CBR/Marshall motorised dual speed 60kN load frame, ASTM.	No.	1			
	- Stabilising bar for the above.	No.	1			
	Carried forward to page 47					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 46					
	- Proving ring for above,10kN and 50kN capacity.	Set	1			
	- Penetration gauge range 0-25mm.	No.	1			
	- CBR piston, including bracket.	No.	1			
	- Swell measurement tripod complete with gauge calibrated in 0.01mm divisions.	No.	30			
	- Soaking tank for CBR mould sufficient for 200 moulds.	No.	1			
	- Tamping bar, steel 13mm diameter, 380mm long.	No.	1			
11.	Miscellaneous Equipment					
	- 1m x 1m x 75mm deep galvanised metal tray.	No.	10			
	- 1.5kg hammer.	No.	4			
	- Riffle box with 10mm slots (BS.1377).	No.	2			
	- Riffle box with 20mm slots (BS.1377).	No.	1			
	- Riffle box with 50mm slots (BS.1377).	No.	1			
	- Wheel barrow.	No.	4			
	- Dustpan brush.	No.	4			
	- Plastic funnels, 65mm dia.	No.	2			
	- Plastic funnels, 100mm dia.	No.	2			
	- Plastic funnels, 140mm dia.	No.	2			
	- Shovel.	No.	6			
	- Pick-axe.	No.	6			
	- Metal scoop, large, 150mm wide.	No.	4			
	- Metal scoop, medium, 100mm wide.	No.	6			
	Carried forward to page 48					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 47					
	- Schmidt concrete test hammer.	No.	1			
	- Jack, 20 tonne, lever, frame, sample extruder.	No.	1			
	- Garden trowel.	No.	4			
	- Steel rule, 500mm long.	No.	3			
	- Stop watch.	No.	1			
	- Steel tray, 0.3m x 0.3m x 0.01m deep.	No.	40			
	- 3.5kg hammer.	No.	4			
	- 7kg hammer.	No.	3			
	- Complete sand patch test apparatus.	No.	1			
	- Cold chisel.	No.	6			
	- Oven, electric thermostatically controlled to any temperature between 60 deg. and 149 deg.C,minimum capacity including dial thermometer range 0-160 deg.C (BS.1377).	No.	2			
	- Gas for the above oven.	No.	2			
	- Single plate electric cooker.	No.	4			
	- 3 metre straight edge including calibrated wedges.	No.	1			
	- Dessicator, 300mm dia.	No.	2			
	- Straight edge, 300mm long, 25mm wide and 3mm thick.	No.	6			
	- Moisture content tin, 75mm dia. cadmium plate or aluminium.	No.	100			
	- Concrete beam moulds 150 x 150 x 750mm.	No.	24			
	- 450mm x 450mm x 9mm plate glass (BS.1377).	No.	4			
	- Refrigerator 250 litre capacity.	No.	1			
	Carried forward to page 49					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 48					
	- Palette knife 200mm blade.	No.	6			
	- Palette knife 100mm blade.	No.	6			
	- BS Sieve brush.	No.	8			
	- 200mm x 200mm x 20mm cadmium plated or aluminium tin.	No.	50			
	- Electronic balance capacity 600g, accurate to 0.001g.	No.	1			
	- Electronic balance capacity 1600g, accurate to 0.01g.	No.	1			
	- Electronic balance capacity 5000g, accurate to 0.1g.	No.	1			
	- Balance (Chain dial) 250g capacity to 0.01g.	No.	1			
	- Balance 2000g capacity accuracy to 0.1g (manual), including weights.	No.	1			
	- Balance 4000g capacity accuracy to 1.0g (manual), including weights.	No.	1			
	- Balance 12000g capacity accuracy to 1.0g (manual), including weights.	No.	2			
	- Balance 50kg capacity accurate to 20 g, including weights.	No.	1			
	- Load rings with dial gauges, 10kN	No.	1			
	- Load rings with dial gauges, 14kN	No.	1			
	- Load rings with dial gauges, 20kN	No.	1			
	- Load rings with dial gauges, 28kN	No.	1			
	- Load rings with dial gauges, 50kN	No.	1			
	- Still for producing distilled water.	No.	1			
	Carried forward to page 50					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 49					
	- Polythene or glass 20 litres storage vessel with tap at bottom.	No.	1			
	- Petrol driven core cutting machine with all accessaries.	No.	1			
	- Core cutting compound.	kg	1,000			
	- Vernier calipers, 250mm.	No.	2			
	- Benkelman beams.	No.	2			
	- Average least dimension gauge.	No.	2			
	- Lockable tool box containing: 1 pair "Molegrips", 2 x 150mm screwdriver 2 x 200mm screwdriver, 2 x 300mm screwdriver, (1 Standard and 1 Phillips head of each) adjustable spanners 200mm and 300mm, 1 pair roundnosed pliers, 1pair general purpose pliers, 1 plastic faced mallet (1 kg), 1 set imperial spanners 1/4" to 15/16", 1 set metric spanners 8mm to 20mm, 2 tyre pressure gauge range 0-100 p.s.i.	No.	1			
	- Plastic or metal bucket including lid, 10 litres capacity.	No.	20			
	- Polythene wash bottle (500ml).	No.	10			
	- A4 size clipboard.	No.	20			
	- Mercury thermometer, range -10 deg.C to 150 deg.C, glass (BS.593).	No.	10			
	- Laboratory thermometer, range +50 deg.C to 250 deg.C (BS.593).	No.	1			
	- Maximum and minimum thermometer (BS.692	No.	1			
	- Rain gauge.	No.	3			
	- Portable dial thermometer +50 deg.C to 250 deg.C accurate to + - 3% with 0.6m long stem.	No.	2			
	Carried forward to page 51					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 50					
	- Pocket dial thermometer +50 deg.C to +250 deg.C accurate to + - 3% with 0.1m long stem.	No.	10			
	- 5 litre capacity steel storage container with leak and dust proof lids for storage of bitumen samples.	No.	100			
	12. Standard Specifications					
	NOTE: Copies of each of the following Standard Specifications:-					
	- BS. 812	No.	1			
	- BS. 882	No.	1			
	- BS. 1377	No.	1			
	- BS. 1881	No.	1			
	- BS. 1924	No.	1			
	- BS. 5835, Part 1	No.	1			
	- Standard Specifications for Transportation Material and Methods of Sampling and Testing (AASHTO) Part I and II,13th Edition.	No.	1			
	– ASTM D 2041-78	No	1			
	13. Concrete: Slump and Cube Manufacture(BS 1881)					
	- Slump cone,tamping rod and base.	Set	2			
	- Concrete cube mould,150mm.	No.	20			
	- Soaking tank for cubes, capacity 50 Nos.	No.	1			
	- Cube tamping bars for Item 1.252.	No.	1			
	- Water test set for concrete mixing water.	No.	1			
	Carried forward to page 52					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 51					
	- Potential alkali reactivity of cement-aggregate combinations.	No.	1			
	- Mortar bar container.	No.	3			
14.	Concrete: Cube Compression Testing and Lean Concrete Unconfined Compressive Strength Testing					
	- Concrete compression machine, to BS.1610 Grade A with 300mm gauge, rectangular plattens, capacity 1560 kN with load pacer.	No.	1			
	- Safety guard for Item 1.255.	No.	1			
	- 50mm distance piece.	No.	1			
	- 70mm distance piece.	No.	1			
	- 100mm distance piece.	No.	1			
	- Mechanical load pacer.	No.	1			
	- Tamping rod, 16mm dia.x 600mm long.	No.	2			
	- Tamping bar, 380mm x 25mm square.	No.	2			
	- Tamping rod, 10mm dia.x 250mm long.	No.	2			
	- Electric vibrating hammer 750 watt with tamping food square.	No.	1			
15.	Potential Alkali Reactivity of Cement-Aggregate Combination and Mortar Bar Container					
	- Comparator mould (25.4 x 25.4 x 285mm)	No.	3			
	- Length comparator	No.	1			
	- ASTM type flow table	No.	1			
	- Curing box(60 x 40 x 60cm)	No.	1			
	- Concrete consistency apparatus	No.	1			
	- Mortar mixer	No.	1			
	Carried forward to page 53					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 52					
16.	Marshall Stability Test Equipment(AASHTO T 245)					
	- Specimen mould including base plate and extension collar.	No.	10			
	- Specimen extractor.	No.	1			
	- Compaction hammer.	No.	2			
	- Compaction pedestal and specimen mould holder.	No.	2			
	- Breaking head mould.	No.	1			
	- CBR/Marshall motorised dual speed 60 kN load frame, ASTM.	No.	1			
	- Electrically operated laboratory mixer 10 litre capacity.	No.	1			
	- Flowmeter.	No.	2			
	- Suitable mechanical mixer.	No.	1			
	- Water bath with cover at least 150mm deep thermostatically controlled to maintain the temperature of the water at 60 deg.C + - 1 deg.C. The tank shall have a perforated false bottom or be equipped with a shelf for supporting specimens 50mm above the bottom of the bath.	No.	2			
	- Isomantle electric heater for bowl of laboratory mixer.	No.	1			
	- Thermometer with 50mm dia. and 180mm stainless steel stem (50 to 250 deg.C).	No.	1			
	- ASTM Marshall automatic compactor, electric.	No.	1			
	Carried forward to page 54					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 53					
17.	Bitumen Extraction Test					
	(1) Extractor Bottle Method,B.S.598, Part 2					
	- Flat bottomed scoop.	No.	2			
	- Steel garden trowel.	No.	2			
	- Large steel spoon.	No.	2			
	- Water resistant gloves.	Pair	3			
	- Foot pump for pressurising air-water assemblies upto a maximum of 700kN/m2 and fitted with flexible hose approxi-mately 1.2m long and connector.	No.	1			
	- Steel bottle 600ml capacity with 49mm rubber stopper.	No.	1			
	- Steel bottle 2500ml capacity with 71mm rubber stopper.	No.	2			
	- Steel bottle 7000ml capacity with 71mm rubber stopper.	No.	1			
	- Flash funnel fpr fitting to the 700ml steel bottles. The rim of the funnel retains a sieve 200mm nominal diameter.	No.	1			
	- Bottle roller-A compact bench mounted unit designed to rotate two bottles simultaneously about their longitudinal axis.	No.	1			
	- Pressure filter complete with cutting tool for making a hole in the filter paper.	No.	1			
	- Filter funnel to take 200mm nominal diameter sieves.	No.	1			
	- Centrifuge complying with as BS 598.	No.	1			
	- Binder recovery apparatus.	No.	1			
	Carried forward to page 55					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 54					
	- Volumetric flask 250ml, 500ml,1000ml and 2000ml capacity of each.	No.	2			
	- Recovery still for Dichloromethane.	No.	1			
	(2) Hot Extractor Method,B.S.596, Part 2					
	- Hot extractor complete with wire qauze container, gasket, cork lid and support assembly.	No.	1			
	- Dean and Stark Receiver with condenser to suit Trichloroethylene.	No.	1			
18.	Consumables					
	- Paraffin wax.	kg	50			
	- Gas.	kg	1,600			
	- Gunny sack.	No.	400			
	- Plastic bag, 900 x 450mm x 1000 gauge.	No.	2,000			
	- Plastic bag, 450 x 300mm x 1000 gauge.	No.	1,000			
	- Filter paper 150mm dia., Whatman No.5 (Boxes of 100).	No.	10			
	- Filter paper 400mm dia., Whatman No.5 (Boxes of 100).	No.	5			
	- Filter paper 100mm dia., Whatman No.5 (Boxes of 100).	No.	5			
	- Trichloroethylene (205 litre drum).	No.	2			
	- Dichloromethane (275 kg drum).	No.	2			
	- Cotton waste (or drying cloths).	kg	100			
	- Filter paper 270mm dia., 33mm with dia. hole in centre, Whatman No.5 (Box of 100)	No.	15			
	Carried forward to page 56					

APPENDIX TO BILL OF QUANTITIES
ITEM 1.05 - SURVEY AND LABORATORY EQUIPMENT

Item No.	Description	Unit	Quantity	Rate	Amount Shillings	Cts
	Brought forward from page 55					
	- Filter paper 400mm diameter Whatman No.54 (Box of 100).	No.	10			
	- Registration paper for compaction test.	sheets	1,000			
	- Moisture-density relation test plot paper.	sheets	1,000			
	- Registration paper for Atterberg Limits.	sheets	1,000			
	- Registration paper for Particle size analysis.	sheets	1,000			
	- Registration paper for CBR.	sheets	1,000			
	Subtotal (Laboratory Equipment, Items 2 to 18)					
	Total (Items 1 to 18) to Item 1.05 on page 1