

BILLS OF QUANTITIES FOR NEW CONSTRUCTION

BILL NO. 1. PRELIMINARIES AND GENERAL ITEMS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1.01	Provide or rent accomodation for Engineer's senior and junior staff				
	(i)Type I - 1 No.	Month	42	65,000.00	2,730,000.00
	(i)Type II - 4 No.	Month	168	55,000.00	9,240,000.00
	(iii) Type III - 6 No.	Month	252	40,000.00	10,080,000.00
	(iv) Type IV - 8 No.	Month	336	30,000.00	10,080,000.00
	(v) Type V - 6 No.	Month	252	21,000.00	5,292,000.00
	Total				37,422,000.00
1.02	E.O item 1.01 for contractor's overhead and profit	%			
1.03	Provide or rent and maintain Engineer's Representative's office as shown on the drawings or as instructed by the Engineer for use during the duration of the Contract, ownership to revert to the Contractor at the end of the Contract	LS			
1.04	Provide or rent and maintain Engineer's Site Laboratory for the duration of the Contract, ownership to revert to the Contractor at the end of the Contract	LS			
1.05	Provide and maintain Laboratory equipment, reagents and other items as priced in Appendix 'A' to the Bill of Quantities for use by the Engineer's representative for the duration of the contract, ownership to revert to the Employer at the end of the Contract.	LS			
1.06A	Provide and maintain furniture , tools and other items for the Engineers Representative office for the duration of the Contract as priced in Appendix `B' , ownership to revert to the Employer at the end of Contract.	LS			
1.06B	Provide and maintain survey equipment as priced in Appendix C for the duration of the contract, ownership to revert to the Employer at the end of Contract.	LS			
1.07	Provide with drivers, fuel and maintain Two (2) new 4WD fully loaded Station Wagon of minimum diesel engine capacity 2800 CC approved by the Engineer for his exclusive use, inclusive of the first 5000km per vehicle month. Vehicle to revert to the Contractor at the end of the project.	Veh Month			
1.08	E.O item 1.07 for total aggregated mileage in excess of 5000 km per vehicle month.	Km			
1.09	Provide with drivers, fuel and maintain one (1) new 4WD fully loaded double cabin pick-up of minimum diesel engine capacity 2500 CC approved by the Engineer for his exclusive use, inclusive of the first 5000km per vehicle month. Vehicle to revert to the Contractor at the end of the project.	Veh Month			
1.10	E.O item 1.09 for total aggregated mileage in excess of 5000 km per vehicle month.	Km			
1.11	Ditto item 1.09, but one (1) new 4WD standard double cabin pick-up of minimum diesel engine capacity 2500 CC approved by the Engineer for his exclusive use, inclusive of the first 5000km per vehicle month. Vehicle to revert to the Contractor at the end of the project.	Veh Month			

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1.12	E.O item 1.11 for total aggregated mileage in excess of 5000 km per vehicle per month.	Km			
1.13	Ditto item 1.09, but two (2) new 4WD Single cabin pick-ups with fibre glass body of minimum diesel engine capacity 2500cc approved by the Engineer for his exclusive use, inclusive of the first 5000km per vehicle month. Vehicle to revert to the Contractor at the end of the project.	Veh Month			
1.14	E.O item 1.13 for total aggregated mileage in excess of 5000 km per vehicle per month.	Km			
1.15	Allow a Prime Cost Sum of Kshs. 10,500,000 for the RE's miscellaneous account to be spent in whole or part as directed by the RE against receipts.	PC Sum	1	10,500,000.00	10,500,000.00
1.16	E.O. item 1.15 for Contractor's overheads and profits.	%			
1.17	Allow a Prime Cost Sum of Kshs. 25,200,000 for attendance upon the Resident Engineer' staff.	PC Sum	1	25,200,000.00	25,200,000.00
1.18	E.O. item 1.17 for Contractor's overheads and profits.	%			
1.19	Provide, erect and maintain publicity signs as directed by the Engineer.	No	2		
1.20	Allow for Prime Cost Sum of Kshs. 2,000,000.00 for training of Engineers	PC Sum	1	2,000,000.00	2,000,000.00
1.21	E.O. item 1.20 for Contractor's overheads and profits.	%			
Bill No. 1 Total Carried Forward to Grand Summary					

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BILL NO. 4 : SITE CLEARANCE AND TOP SOIL STRIPPING

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No separate payments shall be made for gravel for blinding or hauling to spoil unsuitable excavation materials and the cost of such shall be included in the rates and prices</i>				
4.01	Clear site on road reserve including removal of all growths, bushes,hedges, trees, stumps, grub up roots, and other deleterious materials and back-fill and compact to 100% MDD(AASHTO T99) with approved material as directed by the Engineer.	Ha.	53		
4.02	Strip top soil upto 0.2m in thickness along alignment or material sites including removal of all grass and other vegetation,transport to spoil and spread or stock pile for re-use as directed by the Engineer.	m ³	11,000		
4.03	Provide KShs. 1,000,000 for the removal of structures and obstructions as instructed by the Engineer to be paid on dayworks basis	Prov. Sum	1	1,000,000.00	1,000,000.00

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Bill No. 4 Total Carried Forward to Grand Summary

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BILL NO. 5 : EARTHWORKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No separate payments shall be made for gravel for blinding or hauling to spoil unsuitable excavation materials and the cost of such shall be included in the rates and prices</i>				
5.01	Fill in soft material including benching of shoulders and embankments and compaction to 95% MDD (AASHTO T99) in layers not exceeding 150mm	m ³	264,000		
5.02	Extra Over Item 5.01 for compaction of the top 300 subgrade to 100% MDD.	m ³	73,000		
5.03	Ditto item 5.01 but in hard material	m ³	26,400		
5.04	Cut to spoil in soft material	m ³	154,000		
5.05	Ditto item 5.04 but in hard material	m ³	15,400		
5.06	Provide improved subgrade material as instructed by the Engineer and compaction to 100% MDD (AASHTO T99)	m ³	117,000		
5.07	Compaction of top 300mm below formation level in cuts to 100% MDD.(AASHTO T99)	m ³	63,000		
5.08	Compaction of 150mm original ground below fills to 95% MDD.(AASHTO T99)	m ³	32,000		
5.09	Top-soiling prior to planting grass as directed by the Engineer	m ²	44,000		
5.10	Grassing as directed by the Engineer	m ²	44,000		
5.11	Provide Rock Fill to swampy areas as directed by Engineer	m ³	500		
5.12	Provide Filter fabric to swamp under, over and around rock fill	m ²	100		
5.13	Provide and install geogrids	m ²	100		
	Bill No. 5 Total Carried Forward to Grand Summary				

BILL NO. 7 : EXCAVATION AND FILLING OF STRUCTURES

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
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	<i>Note: No separate payments shall be made for gravel for blinding or hauling to spoil unsuitable excavation materials and the cost of such shall be included in the rates and prices</i>				
7.01	Excavate to spoil in soft materials.	m ³	3,000		
7.02	As item 7.01 but in hard material.	m ³	2,000		
7.03	Provide,place and compact rockfill below and around structures.	m ³	3,000		
7.04	Provide and place 150mm thick stone pitching as directed by the Engineer including cement grouting	m ²	20,000		
7.05	Excavate for gabions in soft material.	m ³	4,000		
7.06	Provide and place gabion boxes and mattresses where directed by the Engineer.	m ²	2,200		
7.07	Rockfill to gabions	m ³	1,200		
7.08	Filter fabric behind gabion boxes and structures	m ²	1,000		
7.09	Provide and backfill approved material around new structures, compact 100% MDD (AASHTO T99) in layers not exceeding 150mm.	m ³	500		
7.10	Allow for protection of structures pursuant to Section 708 of the specifications	LS	1		
7.11	Allow for river training in soft material	m ³	300		
7.12	Allow for river diversion	m ³	NOT APPLICABLE		
7.13	Provide coffer dams as directed by the Engineer.	LS	2		
Bill No. 7 Total Carried Forward to Grand Summary					

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BILL NO. 8. CULVERTS AND DRAINAGE WORKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No separate payments shall be made for gravel for blinding or hauling to spoil unsuitable excavation materials and the cost of such shall be included in the rates and prices</i>				
8.01	Excavate for inlet,outfall,mitre and catch water drains in soft material	m ³	4,000		
8.02	As per item 8.01, but for hard material	m ³	2,000		
8.03	Excavation in soft material for pipe culverts,headwalls, wingwalls, apron,toewalls,and drop inlets and compact as directed by the Engineer	m ³	4,000		
8.04	As per item 8.03, but for hard material	m ³	1,000		
8.05	Provide,lay and joint 600mm dia. concrete pipes (precast to BS 5911 Parts 1 & 3) for access roads	m	4,000		
8.06	As for item 8.05 but 900mm dia concrete pipes (precast to BS 5911 parts 1 & 3) for cross culverts	m	2,000		
8.07	As for item 8.05 but 1200mm dia concrete pipes (precast to BS 5911 parts 1 & 3)for cross culverts	m	500		
8.08	Provide and place class 15/20 concrete to beds, surround and haunches	m ³	2,500		
8.09	Provide, place and compact class 25(20) concrete for headwalls, wingwalls, aprons, and toewalls to access and cross pipe culverts including all form work and the provision and placing of reinforcement as shown in the drawings	m ³	1,500		
8.10	Provide and place invert block drains with two course side slabs	m	2,000		
8.11	Construct in concrete class 15(20) side drains scour checks as instructed	m ³	600		
8.12	Provide and place precast concrete slabs 600mm x 600mm x 100mm and place over open lined drains in trade centres and markets (reinforced with A142 wire mesh reinforcement)	No.	500		
8.13	Provide subsoil filter drains fabric to isolated wet spots inclusive of artesian cloth, and 14/20mm single size aggregates as directed by the Engineer	m	500		
8.14	Remove existing pipe culverts of any diameter either for re-use or to be discarded as directed by the Engineer	m	1,000		
8.15	Provide and place A142 wire mesh reinforcement	m ²	200		
8.16	Provide,lay and joint ducts and sleeves including150mm concrete (C15/20) 300mm heavy duty PVC class B with 150mm surround (precast to BS 5911 Parts 1 & 3) ducts/sleeves	m	1,000		
Bill No. 8 Total Carried Forward to Grand Summary					

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BILL NO. 9: PASSAGE OF TRAFFIC

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	NOTE: Notwithstanding the provision of Section 9 of the Standard Specification, no extra payments shall be due as all costs shall be deemed to be included in the rates inserted herein				
9.01	Construct and maintain diversions in maximum lengths of 5km sections as directed by the Engineer, including 150mm wearing course gravel all signage, lighting and barriers	Km	20		
9.02	Grade, water and compact existing road; provide, spread, water and compact gravel as directed by the Engineer for maintenance ahead of works.	Km	40		
9.03	Allow for the passage of traffic through and around the works	LS	1		
Bill No. 9 Total Carried Forward to Grand Summary					

BILL NO. 10: GRADING AND GRAVELLING WORKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No separate payments shall be made for gravel for blinding or hauling and the cost of such shall be included in the rates and prices</i>				
10.01	Provide gravel wearing course, spread and compact to a finished thickness of 150mm to at least 95% M.D.D (AASHTO T-180) and shape to level and tolerance.	m ³	NOT APPLICABLE		
Bill No. 10 Total Carried Forward to Grand Summary					

BILL NO. 12 : NATURAL MATERIAL FOR SUBBASE AND BASE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No overhaul will be paid for separately under these items as it shall be deemed to have been included in the Contractor's rates</i>				
12.01	Provide gravel sub-base material, spread, compact to at least 100% M.D.D (AASHTO T-180) and shape to level and tolerance.	m ³	53,000		
12.02	Ditto item 12.01 but for base	m ³	49,000		
Bill No. 12 Total Carried Forward to Grand Summary					

Bill No. 12A: Total Carried Forward to Grand Summary

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BILL NO. 13 : GRADED CRUSHED STONES AND HAND PACKED STONES FOR SUBBASE AND BASE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
13.01	Provide, Lay, spread and compact Graded Crushed Stone for Sub-base as per Drawings and Specifications	m ³	NOT APPLICABLE		
13.02	Provide, Lay, spread and compact Graded Crushed Stone for base as per Drawings and Specifications	m ³	NOT APPLICABLE		
13.03	Provide, hand pack stones, apply granular material and compact the layer to refusal as directed by the Engineer. The excess granular material shall be thoroughly swept.	m ³	NOT APPLICABLE		
	Bill No. 13 Total Carried Forward to Grand Summary				

BILL NO. 14 : CEMENT OR LIME TREATED SUBBASE AND BASE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No overhaul will be paid for separately under these items as it shall be deemed to have been included in the Contractor's rates</i>				
14.01	Provide and spread Lime as an improvement agent for subbase and base layers	Tonne	1,000		
14.02	Provide and spread Cement as an improvement agent for sub-base and base layers	Tonne	3,700		
14.03	Mix and process natural material with improvement agent for pavement layers as instructed by the Engineer or as specified	m ³	102,000		
14.04	Protection and curing of cement / lime treated base and sub-base layers	m ²	584,000		
	Bill No. 14 Total Carried Forward to Grand Summary				

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BILL NO. 14 A : LEAN CONCRETE AND PAVING BLOCKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
14.01A	Supply, lay and compact 50 mm precast concrete paving blocks for pedestrian walk ways with a 49 N/mm ² cube crushing strength conforming to BS 6717 Part 1 of 1986 or Kenya Bureau of Standards equivalent including 30mm thick sand/quarry dust bed laid on MC 30 or MC 70 primer as specified (The MC 30 or MC 70 shall be paid for in the appropriate bill items)	m ²	NOT APPLICABLE		
14.02A	Supply, lay and compact 80 mm precast concrete paving blocks for carriage ways with a 49 N/mm ² cube crushing strength conforming to BS 6717 Part 1 of 1986 or Kenya Bureau of Standards equivalent including 30mm thick sand/quarry dust bed laid on MC 30 or MC 70 primer as specified (The MC 30 or MC 70 shall be paid for in the appropriate bill items)	m ²			
14.03A	Provide, lay and compact lean concrete base or sub-base to a thickness of 150 mm as provided in the Specifications or as directed by the Engineer.	m ³			
Bill No. 14A Total Carried Forward to Grand Summary					

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BILL NO. 15: BITUMINOUS SURFACE TREATMENT & SURFACE DRESSING TO SHOULDERS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
15.01	Prepare surface of carriageway and shoulders, provide, heat and spray MC 30 cutback bitumen prime coat at 0.8-1.2 Litres/m2.	Litres	370,000		
15.02	Prepare surface of carriageway and shoulders, provide, heat and spray 80/100 bitumen seal coat as first seal at a rate of 1-1.2 Litres/m2.	Litres	N/A		
15.03	Provide, spread and roll 14/20mm precoated chippings	m ²	N/A		
15.04	Prepare surface of carriageway and shoulders, provide, heat and spray 80/100 bitumen seal coat as second seal at a rate of 0.8-1.0 Litres/m2.	Litres	N/A		
15.05	Provide, spread and roll 10/14mm precoated chippings	m ²	N/A		
15.06	Prepare surface of carriageway and shoulders, provide, heat and spray 80/100 bitumen seal coat as third seal at a rate of 0.6- 0.8 Litres/m2.	Litres	N/A		
15.07	Provide, spread and roll 6/10mm precoated chippings	m ²	N/A		
15.08	Provide & spray K1-60 as tack coat on carriageway, shoulders and on rumble strips at a rate of 0.5-0.8 l/m ²	Litres	246,400		
Bill No. 15 Total Carried Forward to Grand Summary					

BILL NO. 16: BITUMINOUS MIXES

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
16.01	Provide, place and compact Asphalt Concrete Type II to a thickness of 35 mm on carriageway Shoulders and bus bays as directed by the Engineer at Bitumen Content of 5.5 - 7.0% by weight of total mix.	m ³	11,760		
16.02	Provide, place and compact Asphalt Concrete Type II to a thickness of 35 mm on shoulders as directed by the Engineer at Bitumen Content of 5.5 - 7.0% by weight of total mix.	m ³	N/A		
16.03	Provide, place and compact Asphalt Concrete Type I (0/14) to a thickness of (<i>insert layer thickness</i>) mm on carriageway and bus bays as directed by the Engineer at Bitumen Content of 5.5 - 7.0% by weight of total mix.	m ³	N/A		
16.04	Provide, place and compact Asphalt Concrete Type I (0/14) to a thickness of (<i>insert layer thickness</i>) mm on shoulders as directed by the Engineer at Bitumen Content of 5.5 - 7.0% by weight of total mix.	m ³	N/A		
16.05	Provide, place and compact Asphalt Concrete Type I (0/20)/SUPER PAVE to a thickness of (<i>insert layer thickness</i>) mm on shoulders as directed by the Engineer at Bitumen Content of 5.5 - 7.0% by weight of total mix.	m ³	N/A		
16.06	Provide, place and compact Asphalt Concrete Type I (0/14) for bumps and rumble strips as directed by the Engineer at Bitumen Content of 5.5 - 7.0% by weight of total mix.	m ³	1,000		
<u>Dense Bitumen Macadam</u>					
16.09	Provide, lay and compact to a thickness of (<i>Insert thickness</i>) mm DBM Base Course on main carriageway, bus bays, & shoulders; all in accordance with the specifications and as directed by the Engineer.	m ³	N/A		
Bill No. 16 Total Carried Forward to Grand Summary					

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BILL NO. 17. CONCRETE WORKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	CONCRETE WORKS				
	<u>Concrete</u>				
17.01	Provide, place and compact Class 15(20) concrete blinding as instructed by the Engineer	m ³	200		
17.02	Provide, place and compact concrete class 25(20) to aprons, wingwalls, abutments, piers, walls and box culverts as shown in drawings.	m ³	950		
17.03	Provide, place and compact concrete class 30(20) to aprons, wingwalls, abutments, piers, walls and bridge deck and beams as shown in drawings.	m ³	250		
	<u>Reinforcement: Provide, cut, bend & fix into position steel reinforcement as shown in the drawings or as instructed by the Engineer</u>				
17.04	High yield reinforcement steel bars to specifications equal to or less than 16mm diameter bar size	Tonne	70		
17.05	High yield bond strength reinforcement steel to specifications greater than 16mm diameter bar size	Tonne	90		
	<u>Formwork : Provide, erect and afterwards dismantle and remove all the formwork as instructed by the Engineer</u>				
17.06	Provide & fix in place formwork to achieve Class U F1 finish	m ²	1,500		
17.07	Provide & fix in place formwork to achieve Class U F2 finish	m ²	1,500		
17.08	Provide & fix in place formwork to achieve Class U F3 finish	m ²	1,500		
Bill No. 17 Total Carried Forward to Grand Summary					

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BILL NO. 19: STRUCTURAL STEEL WORKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
19.01	Provide and install a 18 meter steel inspection and maintenance ladder complete with safety cage.	No.	NOT APPLICABLE		
19.02	Provide and install 100mm diameter heavy duty galvanized steel or Class B PVC down pipes as per specification.	m			
19.03	Provide and install anchor blocks approximate size 150 x 150 mm complete with anchor heads, end bearing plates, wedges or nuts for 19-wire strands 31.8 mm Φ including required accessories	No.			
19.04	Provide and install rigid ferrous metallic galvanized ducts approximate internal diameter 52-58 mm including provision of vents where necessary.	m			
19.05	Provide and install calibrated river gauging station indicating stage heights in meters.	No.			
Bill No. 19 Total Carried Forward to Grand Summary					

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BILL NO. 20: ROAD FURNITURE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
20.01	Provide Road Reserve Boundary posts	No.	160		
20.02	Excavate for, provide & place 250 x 125mm precast concrete raised or ramped kerbs haunched in 100mm thick class 15/20 concrete base bedding and mortar joined in support to carriageway, busbays and junctions as directed by the Engineer.				
	a) Straight kerbs	m	1,000		
	b) Kerbs radius 12m - 6m	m	1,000		
	c) Ditto but radius 5m - 1m	m	1,000		
20.03	As 20.02 but for flush kerbs 100 x 125mm	m	1,000		
20.04	Provide and erect permanent road signs where instructed by the Resident Engineer and in accordance with Special Specifications Clause 2004 as follows:				

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	a) warning signs	No.	50		
	b) Priority prohibitory and mandatory signs	No.	50		
	c) Standard informatory signs	No.	50		
	d) Non standard informatory signs area				
	i) Less than 1.0m ²	No.	30		
	ii) More than 1.0m ² but less than 5m ²	No.	20		
20.05	Provide, deliver, paint and mark the road as specified or as directed by the Engineer, with white reflectorized thermoplastic paint from an approved supplier.	m ²	9,000		
20.06	As item 20.05 but for yellow reflectorized thermoplastic paint	m ²	5,000		
20.07	Provide and erect concrete posts for guardrails complete with spacers (size and interval) as per specifications or as directed by the Engineer	No.	1,750		
20.08	Provide and erect flex-beam guardrails complete with connections as shown on the drawings or as directed by the Engineer	m	7,000		
20.09	Provide Edge marker posts	No.	200		
20.10	Provide kilometre marker posts as directed by the Engineer	No.	20		
20.11	Installation of fencing	m	NOT APPLICABLE		
20.12	Installation of gates	No.	NOT APPLICABLE		
20.13	Construction of speed bumps with Concrete as directed by engineer	m ³	200		
20.14	Provide and install cat-eyes as directed by the Engineer	No.	2,000		
20.15	Provide, plant, and nurture tree seedlings for a period not less than half the construction period of the project or as directed by the Engineer.	No.	1,000		
20.16	Provide and install new guard rails as directed by the Engineer.	m	NOT APPLICABLE		
20.17	Provide and install new guard rail posts including anchor bolts and nuts as directed by the Engineer.	m	NOT APPLICABLE		
20.18	Provide and install new hand rails as directed by the Engineer.	m	NOT APPLICABLE		

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BILL NO. 21: MISCELLANEOUS BRIDGE WORKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
21.01	Provide 100 mm diameter drain pipes and insert heavy duty PVC 100mm diameter as instructed by the Engineer	No	200		
21.02	Provide 100 mm diameter weepholes and insert heavy duty PVC 100mm diameter on abutments or as instructed by the Engineer	No	200		
21.03	Provide and fix hand rails 75 mm diameter on crash barriers, with hold down brackets at not more than 2.5 meter intervals	m	500		
21.04	Provide and apply bitumen emulsion or cutback bitumen or bitumen/rubber latex emulsion to all structural concrete in contact with fill material or cut soil.	m ²	100		
21.05	Provide and place into position handrails to kerbs of bridge deck & ramps as shown on the drawing and as directed by the Engineer.	m	500		
21.06	Provide and place a 0.5-1.0m wide granular material of size 14/20 mm to structural concrete in contact with fill material.	m ³	100		
21.07	Provide and place as directed by the Engineer PVC pipes of diameter 75 mm and length 300 mm to form storm drain pipes of the bridge deck	No.	100		
21.08	Provide and fix bearings as directed by the Engineer.	No.	6		
21.09	Carry out maintenance works on <i>(insert number)</i> No. Bailey Bridges to specifications or as directed by the Engineer	Lump Sum			
Bill No. 21 Total Carried Forward to Grand Summary					

BILL NO. 22: SCHEDULE OF DAYWORKS

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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<u>PLANT</u>				
	<i>The rates inserted herein are to include all operational and Maintenance costs, fuel, oil, grease, drivers/operators wages, supervision, overheads and profit. Only time actually employed upon the work will be paid for and the rates should include for idle time, travelling time and overtime, In accordance with clause 2202 (a) of the specifications. Note: All items of plant must be priced.</i>				
22.01	Crawler dozers with hydraulic attachments to include ripper				
	a) Up to 135 kw rated flywheel power	hrs	20		
	b) Over 135 kw rated flywheel power	hrs	20		
22.02	Motor Grader				
	a) Up to 110kw rated flywheel power	hrs	20		
	b) Over 110kw rated flywheel power	hrs	20		
22.03	Vibratory Roller				
	a) 6.5 - 8.81 tonne un-ballasted weight	hr	20		
	b) Over 8.91 tonne un-ballasted weight	hr	20		
22.04	Hand propelled vibrating roller 650 - 1300kg	hrs	20		
22.05	Cat 950G wheel loader or equivalent	hrs	20		
22.06	10 Tonne tipper lorry	hrs	20		
22.07	Small dumpers, 750-1000kg rated payload	hrs	20		
22.08	Dual purpose hydraulic excavator with backhoe/loader and a rated bucket capacity of upto 1m3.	hrs	20		
22.09	Articulated wheel loader with 1.5-2.0m ³ SAE rated bucket capacity	hrs	20		
22.10	50mm delivery water pump and motor	hrs	20		
22.11	Self propelled water tanker 4,500ls min. capacity with pick-up pump	hrs	20		
22.12	Concrete Mixer of 100 - 150litres	hrs	20		
22.13	Concrete poker vibrator	hrs	20		
	<u>LABOUR</u>				
	<i>The rates inserted herein are to include all costs of labour such as insurance, accomodation, travelling time, over-time, use and maintenance of small tools of trade.Only the actual time engaged upon the work will be paid for.supervision, overheads and Profit.</i>				
22.14	Unskilled Labour	hrs	20		
22.15	Artisans	hrs	20		
22.16	Office attendants and chainmen	hrs	20		
22.17	Watchmen (all round surveillance)	hrs	20		
	TOTAL CARRIED FORWARD TO THE NEXT PAGE				

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ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	TOTAL BROUGHT FORWARD				
	MATERIALS				
	<i>All materials are to comply with the Specification. The rates inserted herein are to include for delivery to the site, storage, handling, overheads and profit</i>				
22.18	Ordinary Portland Cement 42.5 N	Ton	10		
22.19	Hydrated Lime	Ton	10		
22.20	Mild Steel(any diametre)	Ton	10		
22.21	High Yield Steel (any diameter)	Ton	10		
22.22	Fine Aggregate for Concrete	m ³	100		
22.23	Coarse Aggregate for Concrete	m ³	100		
22.24	Wrot Shuttering Timber	m ²	100		
22.25	Rough shuttering timber.	m ²	100		
22.26	Bitumen Emulsion KI-60.	Litre	200		
22.27	Straight run bitumen Grade 80/100.	Litre	200		
22.28	Kerosene	Litre	200		
22.29	14/20 mm nominal size surface precoated chippings	m ³	100		
22.30	6/10mm nominal size surface precoated chippings	m ³	100		
22.31	AC Type I Ex-plant	m ³	50		
22.32	AC Type II Ex-plant	m ³	50		
22.33	Dense Bitumen Macadam	m ³	50		
	Bill No. 22 Total Carried Forward to Grand Summary				

BILLS OF QUANTITIES FOR NEW CONSTRUCTION

BILL NO. 23: PILING WORKS

ITEM	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
23.01	Allow for bringing all plant, equipment and materials necessary for piling and removal after completion.	L/sum	NOT APPLICABLE		
23.02	Move and set up piling rig for piling on each pile position	No.			
23.03	Form 600mm diameter cast insitu reinforced concrete piles. Pile capacity 1750KN reinforced full length. Pile length not	M			
23.04	Allow for sets of projecting steel reinforcements 1000mm from top of the piles	No.			
23.05	Allow for trimming piles to level and bedding projecting reinforcement to shape	No.			
23.06	Allow for testing working piles (2No at abutments position) to one and half working load including all equipment and labour necessary	No.			
23.07	Allow for provision and erection of raked piles as per specifications or as directed by the Engineer.	LS.			
Bill No. 23: Total Carried Forward to Grand Summary					

BILLS OF QUANTITIES FOR NEW CONSTRUCTION

BILL NO. 24: STREET LIGHTING

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
24.01	Supply and install galvanized single bracket, boom < 1m, galvanized steel lighting columns till 8m above ground and 1.2m below ground, according to specification and approved by the Engineer. All columns shall be installed with a triangular lock and three common keys.	No.	NOT APPLICABLE		
24.02	Allow the construction of pit for mounting of columns till 8m height, including excavation, filling and compaction concrete and concrete works, form works and all other related works. Dimensions according to attached drawings.	No.			
24.03	Supply and install rail mounted class "MCBs" mounted in column for high pressure sodium lamps.	No.			
24.04	Supply and install street lighting lantern IP66 complete with LED 74W;> 9100lm and control gear as Trilux 9711SG-AB7L/9100-740 10GIS ET or similar as specified.	No.			
24.05	Supply and install street lighting lantern IP66 complete with high voltage pressure sodium lamp 250W/230V;>32000lm and control gear as Trilux 9721/250 HSE or similar as specified.	No.			
24.06	Supply and install twin cable with earth rated according to VDE 0298-4, not less than 3 x 1.5mm ² from MCB mounted in column luminaire.	m			
24.07	Supply and install weatherproof feeder pillar units according to IEC 60439-1 Degree of protection IP55, impact protection level K10 in accordance with specification, allowing for the circuitry shown on the drawing.	No.			
24.08	Supply and install feeder pillar equipment and wiring according to IEC 60439-1 Degree of protection IP55, impact protection level K10 in accordance with specification, drawing and incorporating 1) meter 2) Cut out 3) Isolator, 4) MCB's 5) T.P and N Contactor, 6)RCB, 7) Surge protection device 8)4 Way T.P. and N distribution board. All equipment according to specification rated to BS EN and IEC as listed in the specification and approved by the Engineer.	No.			
24.09	Allow for excavation for complete foundation for mounting feeder pillars as shown in the drawings.	No.			
24.10	Allow for concrete foundation base for mounting feeder pillars as shown on the drawings.	No.			
24.11	Allow excavation, laying of 100mm PVC cable duct and warning tape, back filling and clearing reinstatement of all as per specifications for power supply poles.	m			
24.12	Supply, install and connect 4 core PVC SWA PVC street light cable complete with glands and accessories rated according to VDE 0298-4 for power supply to poles.	m			
24.13	Supply and install single core earth cable, alongside the above power cable from feeder pillar to each circuit as per the specifications. For the power to supply the poles.	m			
24.14	Allow 100mm thick concrete cover for cable in PVC duct for road crossing.	m			
24.15	Solidly earth every fourth street lighting columns with 1200mm copper earth electrodes complete with all accessories.	No.			
24.16	Allow 25 x 3mm earthing tape and earth pits to feeder pillars including 1200mm earth copper electrodes and other necessary accessories etc. as specified.	No.			

BILLS OF QUANTITIES FOR NEW CONSTRUCTION

24.17	Allow for the cable route markers at changes of direction and at intervals of approximately 30m (between street lighting columns)	No.	NOT APPLICABLE
24.18	Supply and install weatherproof photocell units/control panels, Degree of protection IP55 as specified.	No.	
24.19	Allow for excavation, laying of 100mm PVC Cable duct and warning tape, back filling and clearing reinstatement, all as per the specifications for control cabling.	m	
24.20	Supply, install and connect PVC SWA PVC Cable complete with glands and accessories rated according to VDE 0298-4 for control cabling.	m	
24.21	Supply and installation of step-down transformers, 11/0.4 Kv, 25Kva. Allow for all accessories including concrete works and earthing.	m	
24.22	Allow for construction of 2 x 150mm concrete covered cable duct including excavation, concrete mix, back filling for connection from power source to transformer.	m	
24.23	Supply, install and connect PVC SWA PVC Cable complete with glands and accessories rated according to BS EN/IEC 60228 standards for connection from power source to transformer.	m	
24.24	Supply and install single core earth cable, alongside the above power cable as per the specifications.	m	
24.25	Allow for construction of 2 x 150mm concrete covered cable duct including excavation, concrete mix, backfilling for connection from the transformer to feeder pillar.	m	
24.26	Supply, install and connect PVC SWA PVC Cable complete with glands and accessories rated according to VDE 0298-4 for connection from transformer to feeder pillar.	m	
24.27	Supply and install single core earth cable, alongside the above power cable as per the specifications.	m	
24.28	Allow for construction of manholes along the duct including excavation, concrete and concrete works, form work, heavy duty covers and all other related works.	No.	
24.29	Allow for Contractor's overheads and profits as a percentage of all supply and install items	%	
24.30	Allow for provisionsal sum for payment for Power Company for incoming electricity supply to each feeder pillar	LS	
24.31	Allow for liason with Power Company in connection with works for incoming electricity supply including making such power supply applications and submissions that they require	LS	
24.32	Allow for all working drawings and schematic drawings prior to commencing	LS	
24.33	Allow for the testing and commissioning fo the entire electrical system to the satisfaction of the Power Company & Engineer, including the provision of the equipment	LS	
24.34	Allow for as installed drawings, manuals and details of equipment installed.	LS	

BILLS OF QUANTITIES FOR NEW CONSTRUCTION

BILL NO. 25: ENVIRONMENTAL, HIV/AIDS, AND COVID-19 MITIGATION MEASURES

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
25.01	Allow for a prime cost sum for of KShs 5,000,000 (five Million) for ESIA study, report, and environmental monitoring.	PC sum	1	5,000,000.00	5,000,000.00
25.02	E.O for Item 25.01 for Contractor's Oveheads and Profit	%			
25.03	Allow for engagement of a HIV/AIDS and COVID-19 specialist sub contractor to deal with prevention and awareness activities as per programme to be approved by the Engineer	Months	42		
25.04	Provide male and female condoms to workers and staff for the duration of the contract	No.	30,000		
25.05	Allow for preparation and submmision of monthly reports on HIV/AIDS and COVID-19 awareness and prevention activities. Report to be tabled at site meetings.	Months	42		
25.06	Provide, Install and maintain HIV/AIDS and COVID-19 awareness bill boards with approved message and graphics with maximum area 4m ² fabricated as per specifications of permanent informatory sign boards	No.	4		
25.07	Allow for video shows on HIV/AIDS and COVID-19 related awareness and prevention matters every 3 months	Quartely	11		
25.08	Provide HIV/AIDS and COVID-19 awareness material as follows:				
	a) T-Shirt printed with approved message and graphics	No.	500		
	b) Ditto (a) above but caps	No.	100		
	c) A1 size weather proved posters	No.	20		
	d) A3 size weather proved posters	No.	100		
	e) 200x150mm stickers with HIV/AIDS and COVID-19 awareness/prevention slogan	No.	100		
	f) Key rings with HIV/AIDS and COVID-19 awareness/prevention slogan	No.	500		
	g) Ball point pens with HIV/AIDS and COVID-19 awareness prevention slogan.	No.	500		
25.09	Provide and maintain handwashing points at strategic locations as directed by the Engineer throughout the construction period.	No.	3		
25.10	Provide and maintain hand sanitizing points at strategic locations as directed by the Engineer throughout the construction period.	No.	3		
25.11	Provide face masks as specified or as shall be directed by the Engineer.	No.	20,000		
Bill No. 25 Total Carried Forward to Grand Summary					

BILLS OF QUANTITIES FOR NEW CONSTRUCTION

BILL No. 26: LAND ACQUISITION, AXLE LOAD CONTROL, AND RELOCATION OF SERVICES

Item	Description	Unit	Quantity	Rate	Amount
26.01	Allow a Prime Cost sum of <i>Kshs.3,000,000.00</i> for acquisition of land required for the works,etc.in accordance with Specifications	PC	1	3,000,000.00	3,000,000.00
26.02	E.O. item 26.01 for allowance for Contractor's profit and overheads	%			
26.03	Allow a Prime Cost Sum of <i>KShs. 5,000,000.00</i> for relocation of services as instructed or directed by the Engineer..	PC Sum	1	5,000,000.00	5,000,000.00
26.04	E.O. item 26.03 for Contractor's overheads and profits.	%			
26.05	Provide and maintain for the duration of the contract a mobile weigh bridge with manufacturers warranty, as specified in Appendix 'E' in PDF file. The weigh bridge to revert to employer at commencement of the contract. Allowance for repairs and maintance MUST be included in the quotation.	No	1		
Bill No. 26 Total Carried Forward to Grand Summary					

CONTRACT NO.: RWC 640

GRAND SUMMARY OF BILL OF QUANTITIES

BILL ITEM	DESCRIPTION	AMOUNT(KShs)
1	Preliminaries and General Items	
4	Site Clearance and Top Soil Stripping	
5	Earth Works	
7	Excavation and Filling of Structures	
8	Culverts and Drainage Works	
9	Passage to Traffic	
12	Natural Gravel Base and Subbase	
13	Graded Crushed Stones And Hand Packed Stones For Subbase And Base	
14	Lime/Cement Improved gravel Subbase and Base	
14A	Lean Concrete & paving Blocks	
15	Bituminous Surface Treatment and Surface Dressing	
16	Bituminous Mixes	
17	Concrete Works	
20	Road Furniture	
21	Miscellaneous Bridge works	
22	Schedule of Dayworks.	
25	HIV/AIDS, Gender & Social Issues, Local Participation	
26	Relocation of Services and Land Aquisition	
(A)	SUB-TOTAL (1)	
(B)	Add 15% VARIATION OF PRICE of sub total (1)	
(C)	Add 10% CONTIGENCIES of sub total (1)	
(D)	SUB-TOTAL (2) = (A + B + C)	
(E)	Add ...16% VAT of sub-total (2)	

TOTAL (D+ E)	
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BOQ FOR PERFORMANCE BASED ROUTINE MAINTENANCE RWC 640

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1.01	Road safety				
	i)Removal of fallen trees, fallen rocks, logs, silt, debris, animal carcasses or any other obstruction on the carriageway, shoulders, drainages and the road reserve verge.	KmMonth	1,440		
	ii) Bush clearing including grass/vegetation cutting within the road reserve for visibility and safety as per specifications or as directed by the Engineer.	KmMonth	1,440		
1.02	Clean side drains, mitre drains, cross and access culverts to free flow conditions and cart away the debris and silts to spoil as directed by the Engineer.	KmMonth	1,440		
1.03	Removal of illegal structures and encroachments within the road reserve	LS	1		
A	SUBTOTAL 1 Carried Forward to Grand Summary for performance based routine maintenance				

BOQ FOR PERFORMANCE BASED ROUTINE MAINTENANCE FOR INSTRUCTED WORKKS

BILL NO. 1. PRELIMINARIES AND GENERAL ITEMS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
1.01	Allow a Prime Cost Sum of Kshs. 7,200,000.00 for attendance upon the Resident Engineer' staff for supervision of the PBRM Works	PC Sum	1.0	7,200,000.00	7,200,000.00
1.02	E.O. item 1.02 for Contractor's overheads and profits.	%			
1.03	Provide One (1) new 4WD standard double cabin pick-ups of minimum diesel engine capacity 2200cc approved by the Engineer for his exclusive use, inclusive of the first 5000km per vehicle month. Vehicle to revert to the Contractor at the end of the PBRM Contract.	Veh Month	36.0		
1.04	E.O item 1.11 for total aggregated mileage in excess of 5000 km per vehicle per month.	Km	2,000.0		
	Bill No. 1 Total Carried Forward to Grand Summary				

BILL NO. 5 : EARTHWORKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No separate payments shall be made for gravel for blinding on hard material</i>				
5.01	Fill in soft material including benching of shoulders for repairs to embankments,	m ³	30,000.0		
5.02	Ditto item 5.01 but in hard material	m ³	8,000.0		
5.03	Cut to spoil in soft material	m ³	30,000.0		
5.04	Ditto item 5.03 but in hard material	m ³	3,000.0		
	Bill No. 5 Total Carried Forward to Grand Summary				

BILL NO. 7 : EXCAVATION AND FILLING OF STRUCTURES

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No separate payments shall be made for gravel for blinding or hauling to spoil unsuitable excavation materials and the cost of such shall be included in the rates and prices</i>				
7.01	Provide and place 150mm thick stone pitching as directed by the Engineer including cement grouting	m ²	3,000		
7.02	Excavate for gabions in soft material.	m ³	60		
7.03	Provide and place gabion boxes and mattresses where directed by the Engineer.	m ²	440		
7.04	Rockfill to gabions.	m ³	4,000		
7.05	Filter fabric behind gabion boxes.	m ²	800		
	Bill No. 7 Total Carried Forward to Grand Summary				

BILL NO. 8. CULVERTS AND DRAINAGE WORKS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No separate payments shall be made for gravel for blinding or hauling to spoil unsuitable excavation materials and the cost of such shall be included in the rates and prices</i>				
8.01	Excavate for inlet,outfall,mitre and catch water drains in soft material	m ³	800		
8.02	As per item 8.01, but for hard material	m ³	80		
8.03	Excavation in soft material for pipe culverts,headwalls, wingwalls, apron,toewalls,and drop inlets and compact as directed by the engineer	m ³	1,400		
8.04	As per item 8.03, but for hard material	m ³	140		
8.05	Provide,lay and joint 600mm dia. concrete pipes (precast to BS 5911 Parts 1 & 3) for access roads	m	400		
8.06	Provide,lay and joint 900mm dia. concrete pipes (precast to BS 5911 Parts 1 & 3) for access roads	m	80		
8.07	Provide and place class 15/20 concrete to beds, surround and haunches	m ³	200		
8.08	Provide, place and compact class 25(20) concrete for headwalls, wingwalls, aprons,and toewalls to access and cross pipe culverts including all form work and the provision and placing of reinforcement as shown in the drawings	m ³	200		
8.09	Provide and place invert block drains 300mm radius with two course side slabs	m	200		
8.10	Construct in concrete class 15(20) side drains scour checks as instructed	m ³	40		
Bill No. 8 Total Carried Forward to Grand Summary					

BILL NO. 11 : SHOULDERS TO CARRIAGEWAY PAVEMENT AND PEDESTRIAN WALKWAYS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
11.01	Grade, shape, water and compact existing shoulders, access and busbays where directed by the Engineer	m ²	20,000		
11.02	Cut benches on shoulders , widening and busbays where directed by the Engineer	m ²	20,000		
11.03	Provide, lay and compact 150mm thick gravel to shoulders in accordance with specifications and as directed by the Engineer	m ³	6,000		
Bill No. 11 Total Carried Forward to Grand Summary					

BILL NO. 12 : NATURAL MATERIAL FOR SUBBASE AND BASE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No overhaul will be paid for separately under these items as it shall be deemed to have been included in the Contractor's rates</i>				
12.01	Provide gravel of base quality material, haul, spread, compact to at least 100% M.D.D (AASHTO T-180) and shape to level and tolerance for repairs to pavement layers and shoulder edges as instructed by the Engineer.	m ³	400		
Bill No. 12 Total Carried Forward to Grand Summary					

BILL NO. 14 : CEMENT OR LIME TREATED SUBBASE AND BASE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
	<i>Note: No overhaul will be paid for separately under these items as it shall be</i>				
14.01	Provide and spread Lime as an improvement agent for sub-base and base	Tonne	16		
14.02	Provide and spread Cement as an improvement agent for sub-base and base	Tonne	24		
14.03	Mix and process natural material with improvement agent for pavement layers as	m ³	2,370		
14.04	Curing of cement / lime treated base and sub-base layers	m ²	200		
14.05	Provide, lay and compact hand packed stones to sub-base or base as instructed by the	m ³	NOT		
14.06	Provide, lay and compact paving blocks in repair areas as directed by the Engineer.	m ²	NOT		
14.07	Excavate, shape and repair broken sections for lean concrete layer in accordance with	m ³	NOT		

	Bill No. 14 Total Carried Forward to Grand Summary				

BILL NO. 15: BITUMINOUS SURFACE TREATMENT & SURFACE DRESSING TO SHOULDERS

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
15.01	Prepare surface of road base and shoulders, provide, heat and spray MC 30 cutback bitumen prime coat at 0.8-1.2 Litres/m ² .	Litres	2,000		
15.02	Prepare surface of road base and shoulders, Provide, heat and spray 80/100 bitumen on the carriageway and shoulders at a rate of 1.0-1.2 Litres/m ² .	Litres	308,000		
15.03	Prepare surface of road base and shoulders, Provide, transport, lay and roll 10/14 mm Class 1 and above pre-coated with MC 30, chippings at a rate of 90-110m ² /m ³	m ³	4,000		
15.04	Prepare surface of road base and shoulders, Provide & spray K1-60 as tack coat on carriageway, rate of 0.5-0.8 l/m ²	Litre	500		
15.05	Clean cracks on road surface, apply hot 80/100 bitumen seal and quarry dust/sand.	m	1,000		
Bill No. 15 Total Carried Forward to Grand Summary					

BILL NO. 16: BITUMINOUS MIXES

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
16.01	Provide, lay and compact cold Asphalt Concrete(AC) for repair of carriageway as directed by the Engineer. The rate to include preparing the ground including compaction to receive AC.	m ³	500		
16.02	Provide and erect Asphalt Concrete Type I bumps and rumble strips as directed by the Engineer at Bitumen Content of 5.5 - 7.0% by weight of total mix.	m ³	200		
Bill No. 16 Total Carried Forward to Grand Summary					

BILL NO. 20: ROAD FURNITURE

ITEM	DESCRIPTION	UNIT	QTY	RATE	AMOUNT
20.01	Provide and replace permanent road signs				
	a) warning signs	No.	10		
	b) Priority prohibitory and mandatory signs	No.	10		
	c) Standard informatory signs	No.	10		
	d) Non standard informantor signs area				
	i) Less than 1.0m ²	No.	5		
	ii) More than 1.0m ² but less than 5m ²	No.	5		
20.02	Remove damaged guard rails and transport to store as directed by the Engineer.	m	100		
20.03	Remove, repair and reinstate damaged guard rails as directed by the Engineer.	m	100		
20.04	Provide and install new guard rails as directed by the Engineer.	m	100		
20.05	Remove damaged hand rails and transport to store as directed by the Engineer.	m	100		
20.06	Remove, repair and reinstate damaged hand rails as directed by the Engineer.	m	100		
20.07	Provide and install new hand rails as directed by the Engineer.	m	100		
20.08	Provide, deliver, paint and mark the road as specified or as directed by the Engineer, with white reflectorized thermoplastic paint from an approved supplier.	m ²	9,000		
20.09	As item 20.04 but for yellow reflectorized thermoplastic paint	m ²	5,000		
20.10	Provide and install cat eyes	No.	500		
Bill No. 20 Total Carried Forward to Summary					

SUMMARY OF BILL OF QUANTITIES FOR INSTRUCTED WORKS

BILL ITEM	DESCRIPTION	AMOUNT(KShs)
1	Preliminary and General Items	
5	Earth Works	
7	Excavation and Filling of Structures	
8	Culverts and Drainage Works	
11	Shoulder to Carriageway pavement and pedestrian walkways	
12	Natural Gravel Base and Subbase	
14	Lime/Cement Improved gravel Subbase and Base	
15	Bituminous Surface Treatment and Surface Dressing	
16	Bituminous Mixes	
20	Road furniture	
(B)	SUB-TOTAL (2) FOR INSTRUCTED WORKS - Carried forward to Grand summary for instructed maintenance works	

GRAND SUMMARY FOR BILL OF QUANTITIES MAINTENANCE WORKS

BILL ITEM	DESCRIPTION	AMOUNT(KShs)
(C)	Total for Performance based routine maintenance works (PBRM) -SUB TOTAL 1	
(D)	Total for instructed maintenance works -SUB TOTAL 2	
(E)	SUB TOTAL (3) = (C + D)	
(F)	Add 15% VARIATION OF PRICE of SUB TOTAL (3)	
(G)	Add 5% CONTIGENCIES of SUB TOTAL (3)	
(H)	SUB TOTAL (4) = (E + F + G)	
(I)	Add ...16% VAT of SUB TOTAL (4)	
	GRAND TOTAL (CARRIED TO FORM OF BID AS BID SUM 2) = (H + I)	

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S/NO	DESCRIPTION	AMOUNT(KSHS)
1	BID SUM 1	
2	BID SUM 2	
	TOTAL AMOUNT	

APPENDIX A

APPENDIX TO BILL ITEM 1.05:
PROVIDE AND MAINTAIN FURNITURE AND EQUIPMENT FOR THE ENGINEER'S LABORATORY

ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSHS)	AMOUNT (KSHS)
	1. FURNITURE				
A104/1.01	Desk 2.2x0.9 m with chair and lockup drawers	No	2		
A104/1.02	Desk chair (standard)	No	15		
A104/1.03	Stationery cupboard, 1.2 m ³ , lockable	No	2		
A104/1.04	Steel filing cabinet, 4 drawers, lockable	No	2		
A104/1.05	Steel filing cabinet, 2 drawers, lockable	No	2		
A104/1.06	Bookshelf, 3 shelves 1.2 m long (to hold box files)	No	2		
A104/1.07	Table - 6 m ²	No	2		
A104/1.08	Two Plate electric heater	No	1		
A104/1.09	Fire extinguisher, 10 litre capacity, CO ₂ type	No	4		
A104/1.10	Complete first aid kit	No	2		
	EQUIPMENT				
	<i>(The following equipment shall be purpose made for use in the Engineer's laboratories and shall comply with the relevant British (BS) or American (AASHTO) Standard)</i>				
	2. General Equipment				
A104/2.02	2.49kg. Compaction hammer, drop regulated to 304.8mm	No	2		
A104/2.03	4.535kg compaction hammer drop regulated to 457.2mm	No	2		
A104/2.04	Electric vibrating Kango Hammer fitted with steel tamper(BS 1377) with support frame	No	1		
A104/2.05	Straight edge 300 mm long with handles	No	4		
A104/2.06	Steel Tamper (BS1377) compatible with Kango hammer	No	3		
A104/2.07	Compaction mould 152.4 mm. dia x 116.43 mm complete with base plate and extension collar, 101.6 mm	No	2		
A104/2.08	Galvanized metal tray 1m x 0.5m x 75 mm deep	No	4		
A104/2.09	75mm brush	No	2		
A104/2.10	Semi-automatic balance, 25kg Capacity accurate to 1g, including weights	No	1		
A104/2.11	20mm BS Sieve, 300mm diameter	No	1		
A104/2.12	Stop Clock	No	2		
A104/2.13	Thermostatically controlled electric oven 105-110 ⁰ C, capacity 0.225 m ³	No	2		
A104/2.14	As above but gas heated	No	1		
A104/2.15	Moisture content tins, 75 mm dia, Cadmium or aluminium plated	No	60		
A104/2.16	Cone penetrometer with gauge and automatically controlled test cup	No	2		
C/Forward to next page					

	B/Forward from previous page				
	3. Density (Sand replacement method BS 1377)				
A104/3.01	Metal containers 450mm diameter	No	2		
A104/3.02	Stainless steel tray 305mm diameter	No	2		
A104/3.03	Metal tray with 150 mm diameter hole in the centre, 300mmx300 mm square or equivalent area, 40mm deep	No	2		
A104/3.04	Metal tray with 200mm diameter hole in the centre, 500mm x 500 mm square , 50 mm deep	No	2		
A104/3.05	Steel pegs for fixing tray in position	No	15		
A104/3.06	Sand pouring cylinder, 150 mm diameter	No	2		
A104/3.07	Sand pouring cylinder, 215 mm diameter	No	2		
A104/3.08	Cold steel chisel 20mm x 300mmm	No	4		
A104/3.09	Cold steel chisel 10mm x 250mmm	No	4		
A104/3.10	1.5kg, 3.5kg hammers and 1kg rubber mallet	Set	1		
A104/3.11	Scoop for removing excavated material from hole, 250 mm long handle	No	6		
A104/3.12	100mm brush, soft	No	3		
A104/3.13	50mm brush, soft	No	3		
A104/3.14	Primus gas stove	No	1		
A104/3.15	Calibrating can 150 mm diameter x 150 mm deep	No	3		
A104/3.16	Ditto but 200 mm diameter x 250 mm deep	No	3		
	5. CBR (AASHTO T193)				
A104/5.01	CBR mould, 152.4 mm dia x 178 mm high, complete with perforated base plate and extension collar 50.8 mm high that can be fitted to either side of mould	No	50		
A104/5.02	Perforated swell plate 150 mm dia with an adjustable centre post of rust proof metal provided with a lock-nut	No	40		
A104/5.03	2.25 kg split surcharge weight	No	2		
A104/5.04	Set of annular surcharge weights	No	1		
A104/5.05	Solid base plate for CBR mould	No	2		
A104/5.06	Static compaction displacer discs 1 No x 61.4 mm, 1 No x 50.8 mm and 2 No x 38.8 mm thick with handles	set	1		
A104/5.07	Disk lifting handle	No	2		
A104/5.08	Central extruder, complete with 20kN hydraulic jack and accessories	No	1		
A104/5.09	Automatic CBR Proctor Compaction press, 50 tonnes capacity with an adjustable distance between platens of 530mm-250mm, rammer weights and automatic count selector	No	1		
A104/5.10	Set of guards for above press.	No	1		
A104/5.11	50 kN CBR Load frame complete with stabilising bar (electric and hand operated) including proving rings for 10KN, 28KN and 50KN, piston and bracket	No	1		
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A104/5.12	Penetration gauge range 0 - 25mm	No	2	
A104/5.13	CBR piston including bracket	No	2	
A104/5.14	Swell measurement tripod complete with guage calibrated in 0.01 mm divisions	No	2	
A104/5.15	Soaking tank for CBR mould sufficient for 50 moulds	No	1	
6. Relative Density of Aggregates (BS 812)				
A104/6.01	Wire mesh basket with apertures not greater than 6.5 mm large enough to contain 2.5 kg of aggregate	No	2	
A104/6.02	A stout watertight container in which the basket can be freely suspended	No	2	
A104/6.03	Soft absorbent cloth (tea towel)	No	10	
A104/6.04	Shallow tray of area not less than 0.065 m ²	No	2	
A104/6.05	An airtight container of similar capacity to the basket	No	2	
A104/6.06	Pycnometer of 1 litre capacity	No	4	
A104/6.07	Semi automatic 5 kg balance accurate to 0.1g to be of size and type to permit the basket containing the sample to be suspended in water(to be supplied with weights)	No	1	
A104/6.08	Hot air drier (electric)	No	2	
7. Flakiness (BS 812)				
A104/7.01	Thickness gauge (various sizes)	No	2	
8. Sieve Analysis (BS 1377)				
A104/8.01	BS Sieve 300mm diameter in sizes 75, 63, 50, 37.5, 28, 20, 14, 10, 6.3, 5 and 4 mm, plus lid and receiver	Set	2	
A104/8.02	BS Sieve 200mm diameter in sizes 2, 1, 0.6, 0.5, 0.425, 0.300,0.150 and 0.075 mm, plus lid and receiver	Set	2	
A104/8.03	Electric sieve shaker	No	1	
A104/8.04	BS sieve 200mm diameter 0.425 and 0.075 mm	set	1	
A104/8.05	1 m x 1 m x 75mm deep galvanized metal tray	No	10	
A104/8.06	Riffle box with 50mm slots (BS 1377)	No	1	
9. Miscellaneous Equipment				
A104/9.01	Wheel barrow	No	3	
A104/9.02	Dustpan and brush	No	3	
A104/9.03	Shovel	No	4	
A104/9.04	Pick axe with handle	No	4	
A104/9.05	Metal scoop, large (150mm wide)	No	3	
A104/9.06	Metal scoop, medium (100mm wide)	No	4	
A104/9.07	Garden trowel	No	2	
A104/9.08	Steel tray 0.3m x 0.3m x 0.01m deep	No	15	
A104/9.09	Palette knife 200mm long blade	No	3	
A104/9.10	Palette knife 100mm long blade	No	4	
A104/9.11	BS sieve 450mm diameter, 37.5mm	No	1	
A104/9.12	BS sieve 450mm diameter, 20mm	No	1	
A104/9.13	BS sieve 450mm diameter, 5mm	No	1	
A104/9.14	BS sieve 450mm diameter, 0.425mm	No	1	
A104/9.15	BS sieve 450mm diameter, 0.3mm	No	1	
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A104/9.16	BS sieve 450mm diameter, 0.075mm	No	1		
A104/9.17	Set of lid and receiver for metal scoop and steel trays	No	2		
A104/9.18	BS Sieve brush	No	2		
A104/9.19	Measuring cylinder set, 25 ml, 100 ml, 500 ml, 1000 ml, 2000 ml	set	2		
A104/9.20	Glass jar capacity 5 litres with lid	No	10		
A104/9.21	200mm x 200mm x 20mm cadmium plated or aluminium tin	No	20		
A104/9.22	Electronic balance capacity 1000 g, accurate to 0.01gm.	No	1		
A104/9.23	Balance 2000 g capacity accuracy to 0.1g (manual), including weights	No	1		
A104/9.24	Balance 50kg capacity accurate to 10gm including weights	No	1		
A104/9.25	Still for producing distilled water	No	1		
A104/9.26	Polythene or glass 20 litres storage vessel with tap at bottom	No	2		
A104/9.27	Stiff broom	No	2		
A104/9.28	Vernier calipers, 150mm	No	2		
A104/9.29	Vernier calipers, 250mm	No	2		
A104/9.30	Pestle and mortar	No	2		
A104/9.31	Linear shrinkage mould (BS 1377)	No	6		
A104/9.32	Liquid Limit Device	No	2		
A104/9.33	Average least dimension gauge	No	2		
A104/9.34	Lockable tool box containing: 1 pr "Molegrips", 2 x 150mm screwdriver, 2 x 200 mm screwdriver, 2 x 300 mm screwdriver, (1 standard and 1 Phillips head of each) adjustable spanners 200 mm and 300 mm, 1 pair round nosed pliers, 1 pair general purpose pliers,	No	1		
A104/9.35	Plastic or metal bucket including lid, 10 litres capacity	No	6		
A104/9.36	Polythene wash bottle (500 ml)	No	5		
A104/9.37	A4 size clipboard	No	4		
A104/9.38	Thermometer, range -10°C to 150°C, glass (BS 593)	No	2		
A104/9.39	Laboratory thermometer, range + 0°C to + 250°C (BS 593)	No	2		
A104/9.40	Maximum and minimum thermometer (BS692)	No	2		
A104/9.41	Rain gauge	No	1		
A104/9.42	Portable dial thermometer + 50°C to +250°C accurate to ± 3%	No	1		
A104/9.43	Ditto with 0.75m long stem	No	1		
A104/9.44	Pocket thermometer + 50°C to +250°C accurate to ± 3% with 0.1 m stem	No	2		
A104/9.45	5 litre capacity steel storage containers with leak and dust proof lids for storage of bitumen samples	No	50		
A104/9.46	Hotplate 200mm diameter with Simmerstat heat control unit.	No	2		
A104/9.47	450mm diameter x 150mm deep metal mason's basin	No	6		
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	11. Concrete: Slump and Cube Manufacture (BS 1881)				
A104/11.01	Slump cone, tamping rod and base	set	2		
A104/11.02	Concrete cube mould, 150mm cube	No	30		
A104/11.03	Soaking tank for cubes (capacity 50 No.)	No	1		
A104/11.04	Cube tamping bars	No	10		
	12. Concrete: Cube Compression Testing				
A104/12.01	Concrete compression machine to BS1610 Grade A with 300 mm gauge, rectangular platens, capacity 1560 kN with load spacer				
A104/12.02	Safety guard for above	No	1		
A104/12.03	50mm distance piece				
A104/12.04	70mm distance piece				
A104/12.05	Electro-mechanical load pacer, 100 mm or equivalent distance piece				
	13. Aggregate and Chippings				
A104/13.01	Sand equivalent to AASHTO T176 including graduated plastic cylinder, rubber stopper, irrigation tube weighted foot assembly, siphon assembly, 85ml tin box (57mm dia.), 100 mm dia wide mouth funnel, stop clock, mechanical shaker and 10 Beaker 250ml	Set	1		
A104/13.02	Aggregate Crushing Value Apparatus, 150 mm nominal diameter, including plunger and base plate	No	2		
A104/13.03	Tamping rod and metal measure for above	No	2		
A104/13.04	Los Angeles Abrasion to ASTM standards	Set	4		
A104/13.05	Set of 12 abrasive charges	No	1		
A104/13.06	Thermometer, 0°C to +50°C	No	2		
A104/13.07	Thermometer, 0°C to +250°C	No	2		
A104/13.08	Reagent grade Silica gel, 500g container	No	2		
A104/13.09		No	50		
	14. Bitumen Spray Test (BS 1707)				
A104/14.1	Transverse distribution of spray test bitumen distributor (depot tray test to BS 1707) or equivalent.	Set	1		
A104/14.02	Steel tray 20 mm deep x0.1m ² (for measuring bitumen spray rates) with purpose made detachable handle 1.5m long.	No.	4		
	16. Bitumen Extraction Test				
	A) Extractor Bottle Method BS 598 Part 2				
A104/16.01	Electronic top pan balance 4kg capacity, sensitive to 0.1gm	No	1		
A104/16.02	Flat bottomed scoop	No	3		
A104/16.03	Steel garden trowel	No	2		
A104/16.04	Large steel spoon	No	2		
A104/16.05	Heat resistant gloves	pair	10		
A104/16.06	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	2		
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A104/16.07	Steel bottle 600ml capacity with 49mm rubber stopper	No	2		
A104/16.08	Steel bottle 2500ml capacity with 71mm rubber stopper	No	2		
A104/16.09	Steel bottle 7000ml capacity with 71mm rubber stopper	No	2		
A104/16.10	Flask funnel for fitting to the 700ml steel bottle with rim of funnel retaining sieve 200mm nominal diameter	No	2		
A104/16.11	Bottle roller compact bench mounted unit designed to rotate 2 bottles simultaneously about longitudinal axis	No	1		
A104/16.12	Pressure filter complete with cutting tool for making hole in the filter paper	No	1		
A104/16.13	Filter funnel to take 200mm nominal diameter sieves	No	2		
A104/16.14	Centrifuge complying with BS 598	No	1		
A104/16.15	Binder recovery	No	1		
A104/16.16	Volumetric flask 250ml, 500ml, 1000ml and 2000ml capacity	set	2		
A104/16.17	Recovery still for Dichloromethane	No	1		
	B) Hot Extractor Method BS 598 Part 2				
A104/16.18	Hot extractor complete with wire gauze container gasket, cork lid and support assembly	No	2		
A104/16.19	Dean and Stark receiver with condenser to suite Trichloroethylene	No	2		
A104/16.20	Gyratory compactor ELE Servo Pac or equivalent with 1 x 100mm and 1 x 150mm moulds	No	2		
A104/16.21	PRD Vibrating hammer compactor complete with 6 moulds, 7 base plates from ELE	SET	1		
A104/16.22	Two (2) sets of Tamping foot 102mm diameter and 146mm diameter and shanks to fit the supplied vibratory hammer	SET	2		
	17. Consumables				
A104/17.01	Paraffin wax	Kg	50		
A104/17.02	Gunny sack	No	500		
A104/17.03	Plastic bag 900x450x1000 gauge	No	500		
A104/17.04	Plastic bag 450x300x1000 gauge	No	500		
A104/17.05	Filter paper 150mm diameter Whatman No. 5 (Boxes of 100)	No	20		
A104/17.06	Filter paper 400mm diameter Whatman No. 5 (Boxes of 100)	No	20		
A104/17.07	Filter paper 100mm diameter Whatman No. 5 (Boxes of 100)	No	20		
A104/17.08	Filter paper 400mm diameter Whatman No. 54 (Boxes of 100)	No	10		
A104/17.09	Filter paper 270mm diameter with 33 diameter hole at centre Whatman No. 5 (Boxes of 100)	No	15		
A104/17.10	Trichloroethylene (205 Litre Drum)	No	5		
A104/17.11	Dichloromethane	kg	200		
A104/17.12	Cotton waste	kg	50		
A104/17.13	13kg Gas cylinders filled with gas and with compatible gas burners	No	5		
A104/17.14	Sodium sulphate	kg	45		
A104/17.15	Sand for density test	kg	250		
	C/Forward to item 1.05				

APPENDIX B

APPENDIX TO BILL ITEM 1.06A: PROVIDE, FURNISH AND MAINTAIN THE R.E.'S OFFICE				
DESCRIPTION	UNIT	QUANTITY	RATE (KSHS)	AMOUNT (KSHS)
1. ENGINEER'S MAIN OFFICE AND FURNITURE				
Executive desk 2.2x0.9 m with six lockup drawers	No	2		
Desk 2.2x0.9 m with chair and three lockup drawers	No	4		
Office tables 2.2x0.9 m	No	5		
Executive Swivel orthopaedic chair adjustable height	No	6		
Standard office chairs	No	10		
Typist's desk	No	1		
Typist's chair	No.	1		
Lockable steel stationery cupboard, 1.2 m ³ , lockable	No.	2		
Medium size steel filing cabinet, 4 drawers lockable	No.	2		
Medium size steel filing cabinet, 2 lockable drawers	No.	2		
Bookshelf, 1.5 m wide 3 shelves (for box files) sliding glass door	No.	2		
Conference table with 15 chairs	No.	1		
Waste paper basket	No.	10		
Curtains for office and laboratory -for all windows and doors	Set	2		
Ordinary 2 hole paper punch	No	5		
Heavy duty 2 hole paper punch	No	2		
Computer meeting the following specifications or equivalent: Personal computer with 17" screen full multimedia, 500GB hard disk, 4.0GB RAM, Core i7 processor, complete with all accessories preloaded with latest versions of windows OS, MS Office, Professional and MS Proiect Autocad Civil 3D 2016 and Licences for above computers	No	5		
Laptop PC with Intel Core i7-4510U Processor 15.4" screen, CPU @ 2.6GHz 8GB RAM 1TB 8xDVD+/-RW approved with Microsoft Windows professional	No	4		
Latest HP (A4) Laser Printer with accessories	No	5		
Latest HP (A3) Laser Colour Printer with accessories	No	1		
UPS 600 VA	No	6		
wall clocks, battery powered min size 350mm x 350mm	No	6		
First Aid Kit	No	4		
Fire Extinguisher	No	4		
Filing Tray - set of 3no.	set	10		
Refrigerator minimum capacity 0.2 m ³	No	1		
Drinking water dispenser, hot/cold	No	3		
Table - 0.8 m ² surface area	No	1		
Cupboard, 0.15 m ³ , lockable	No	1		
13 Kg Gas cylinder with three gas burners	No	2		
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DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
B/Forward				
A3 Photocopier (approved make), with feeder sorting trays, scanner and print capability	No	1		
Reams of A4 photocopying paper	No	120		
Reams of A3 photocopying paper	No	24		
Electronic scientific calculator, Casio fx 991ES PLUS or equivalent approved	No	6		
Stapling machine Ofrex size 50 or similar with 5000 staples	No	6		
Heavy duty punch and spiral binder, IBICO AG or similar approved	No	2		
Digital Camera, 16.1 Megapixel(min), 1920x1080 full HD movie recording, optical steadyShot, sweep panorama, 2.7" LCD screen, minimum 5x digital zoom, multimedia card/SD 8GB memory, 12 scene selection modes, all inclusive.	No	2		
Provision of mobile phones for supervision team with the latest android version to the approval of the Engineer.	item	8		
Total carried to Bill Item 1.06A				

APPENDIX C

APPENDIX TO BILL ITEM 1.06B ENGINEERS'S SURVEY EQUIPMENT					
ITEM	Description	UNIT	QTY	RATE	AMOUNT(Kshs)
1.01	<p>Digital Total Station reading to 1"accuracy (<i>one second</i>) with the following facilities:</p> <ul style="list-style-type: none"> · Inbuilt data logger · Uploading/downloading software · Data transfer cable · Battery (<i>2No</i>) · Battery charger · Tool kit · Two face keyboard · User manual <p>It must have the following inbuilt survey programs as a minimum</p> <ul style="list-style-type: none"> · Survey · Staking out · Resection/intersection · Traverse · Cogo 	No.	0		
1.02	The following mandatory total station accessories must be included per Total station instrument				
a)	1No. Heavy duty telescopic tripod(<i>preferably wooden</i>)	No.	0		
b)	Telescopic plumbing prism pole complete with a prism and prism holder with target and plumbing bubble (<i>length not less than 2.15m</i>)	No.	0		
c)	· Triple prism holder set, in a casing, comprising triple prisms, prisms holder with target, tribrach and a tribrach adaptor	No.	0		
d)	· Survey umbrella	No.	1		
e)	· 1No.Telescopic Tripod	No.	0		
1.03	<p>Engineer's Automatic Level Wild NAK 2 or similar with a tripod and the following specifications</p> <ul style="list-style-type: none"> · Accuracy of 0.7 mm per 1 km double 	No.	2		

	· Standard magnification of: 32x				
	· Shortest focusing distance of 1.6m				
	· Compensator setting accuracy of 0.3"				
	Total carried forward to next page				

ITEM	Description	UNIT	QTY	RATE	AMOUNT(Kshs)
	Brought Forward				
1.04	Hand held GPS with accuracy of 1 Metre	No.	1		
1.05	Set of two way radio communication with a range of 1 kilometer	set.	1		
1.06	5 M Leveling staff with leveling bubble	No.	4		
1.07	3 M Ranging Rods	No.	10		
1.08	equivalent	No.	3		
1.09	50m. Linen Measuring Tape	No.	5		
1.10	1m stainless steel straight edge	No.	1		
1.11	3 m tape measure	No.	10		
1.12	Sledge hammer 2kg weight	No.	2		
1.13	Mattock	No.	2		
1.14	Pangas (16'')	No.	10		
1.15	Marker Pens	No.	20		
1.16	Reflector Jackets	No.	30		
1.17	Levelling Survey books	No.	100		
1.18	Provision of Geodetic GNSS receivers comprising of one base and two rovers as per the specifications in Appendix D	No.	1.00		
1.19	Provide with license and install the latest version of (<i>insert software</i>)	L.S			
	Total carried to Bill Item 1.06B				

APPENDIX D

S/No.	Description	GEODETIC GLOBAL NAVIGATION SATELLITE SYSTEM SPECIFICATIONS (GNSS)	REMARKS
1	Geodetic GNSS Receivers	<p>General Characteristics</p> <p>Geodetic Set enabled for both Static and RTK functions with respective supporting software and accessories</p> <hr/> <p>Specific Specifications</p> <p>1. Channels: At least 120 enabled for simultaneous signal tracking</p> <hr/> <p>2. Reception</p> <p>Must be enabled for Multi - Constellation / Frequency i.e current systems e.g. GPS (L1, L2, L2C, L5) GLONASS (L1C/A, L1P, L2C/A); SBAS (EGNOS, WAAS, MSAS, GAGAN, QZSS) Galileo ready: E1, E5A, E5B BeiDou ready (Compass) : B1, B2 Must have some multipath mitigation technology embeded Note: Should be configured to receive new and upcoming constellations (if any)</p>	
		<p>2. Accuracy :</p> <hr/> <p>Real Time Kinematics (RTK)</p> <ul style="list-style-type: none"> - Horizontal: 8 mm + 1 ppm RMS - Vertical: 15 mm + 1 ppm RMS - Initialization time: typically < 5 s - Initialisation reliability >99.9% <p>Post Processing Static</p> <ul style="list-style-type: none"> - Horizontal: 3 mm + 0.5 ppm RMS - Vertical: 5 mm + 0.5 ppm RMS - Baseline Length: ≤ 80 km 	
		<p>3. Special functionalities</p> <hr/> <p>Extended RTK range - base setup simultaneously</p> <ul style="list-style-type: none"> - the base to provide WiFi hotspot functionality for better control/setup of the receiver - the base to provide web interface functionality via any smart phone, tablet or computer - the base to provide NTRIP caster and dynDNS functions <hr/> <p>Increased reliability - rover setup</p> <ul style="list-style-type: none"> - the rover to provide a mode for better performance under difficult conditions (close to buildings, trees and urban areas) - the rover to be able to connect to any CORS GNSS networks or Single stations via internet 	
		<p>4. Communications</p> <hr/> <p>a) I/O</p> <ul style="list-style-type: none"> · 2x TNC connector (1 for UMTS antenna and 1 for UHF antenna) · 2x LEMO · 1x high speed USB · Integrated GSM/GPRS modem · Integrated Bluetooth class 2 	
		<ul style="list-style-type: none"> · Optional radio modem (2): - Internal Rx/Tx: 403-473 MHz - External Radio: 1W - 35W adjustable (at least 12Km range) · Should be configured to log into any upcoming CORS protocol · Should be enabled to use SIM card 	