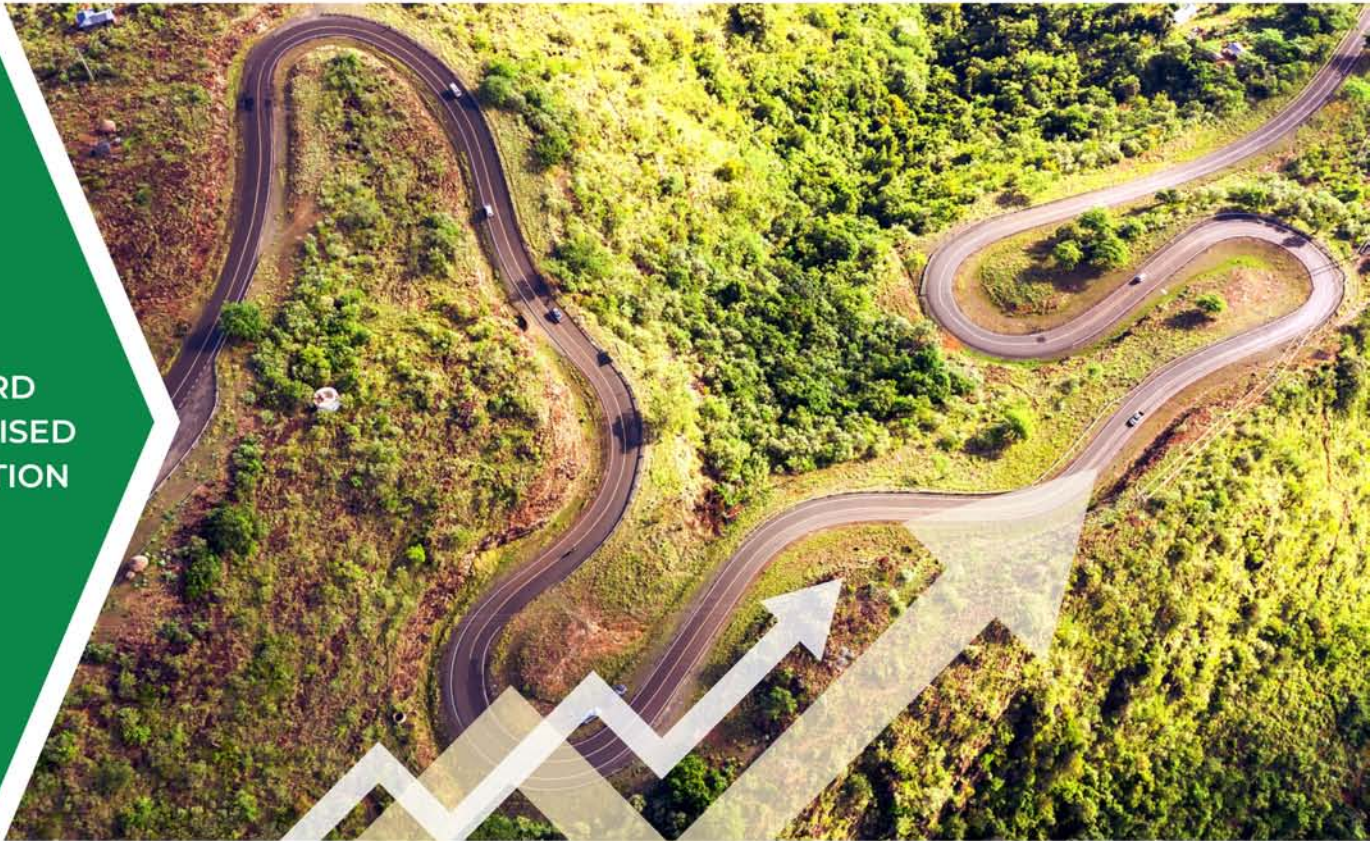




COST ESTIMATION MANUAL 2022-2023

FOR ROAD CONSTRUCTION AND
MAINTENANCE WORKS

THIRD
REVISED
EDITION



COAST REGION



Cost Estimation Manual

for Road Maintenance Works

Third Revised Edition | 2022-2023

Foreword



The Kenya Roads Board was established by the Act of Parliament No.7 of 1999, with the mandate to oversee the road network in Kenya and coordinate the maintenance, rehabilitation and development using Road Maintenance Levy Fund (RMLF) and advise the Minister responsible for roads on all matters related thereto.

Our country's long-term development blueprint, Vision 2030 aims to transform Kenya into an industrialized middle-income country offering a high quality of life to all our citizens. Kenya made significant progress in implementing the policies, programmes and projects outlined in the second and third Medium Term Plans (MTP) which were implemented in 2013-2017 and 2018 – 2022 respectively.

One of the activities in the Medium-Term Plans of the Vision 2030 was to contain rising costs in the construction and maintenance of roads and through this, an initiative towards developing a framework for accurate cost estimation in the Roads Sub-Sector led to the development of the Cost Estimation Manual (CEM) for road maintenance works. It was developed by the Ministry in charge of Roads with support from the Japanese International Cooperation Authority (JICA) and officially published in November 2011.

In the year 2020, the Kenya Roads Board was appointed as the administrator of the Cost Estimation system and charged with the responsibility of updating the system every two years. In view of this, the Board has developed this Cost Estimation Manual (CEM 2022) in line with its mandate of contributing to the Government's goals in achieving vision 2030.

This CEM aims at providing guidance and developing a best practice standard for Road Agencies (RAs) mandated with the implementation of road works to understand the pertinent issues in preparing accurate estimates for road maintenance projects. The CEM will also guide the RAs and Contractors in preparation of unit rates, planning and monitoring of costs in construction and maintenance of roads. In view of this, it is necessary to be updating the CEM continuously to reflect changing work methodologies and fiscal conditions.

The Board is required to update this manual every two years with interim revisions conducted depending on the nature of the changes under consideration. Since the publication of the first CEM in 2011, the manual has been revised twice by Kenya Roads Board in conjunction with JICA and the RAs.

I would like to thank all those who participated in the process of the preparation of this Manual, in addition to those who provided inputs and necessary support. In particular, I recognize and acknowledge the contribution and dedication of the consultant team, ITEC Engineering Ltd, the Road Agencies and the secretariat team from KRB.

It is my hope that effective use of this manual, will lead to cost-effectiveness in road maintenance, rehabilitation and development, and hence spurring the country towards the achievement of Vision 2030.

Rashid Mohamed, MBS
DIRECTOR GENERAL

Acknowledgement

Kenya Roads Board through the Director General, Rashid Mohamed, MBS, would like to express sincere gratitude to the Inter-Agency Cost Estimation Task Force for its initiative towards the update and publication of the Cost Estimation Manual, 2022. In particular, gratitude goes to the Kenya Roads Board Project Implementation Team led by the Director Policy and Planning, Eng. Tom Omai, Project Manager, Thomas Bundi, assisted by Tabitha Kariuki and Caleb Mathuva.

We further extend special thanks to the following Road Agencies and organisations that participated in the Cost Estimation 2022 validation workshop:

Chief Engineer Roads, State Department of Roads
Kenya National Highways Authority (KeNHA)
Kenya Urban Roads Authority (KURA)
Kenya Rural Roads Authority (KeRRA)
Kenya Wildlife Services (KWS)

This Manual would not have come to fruition without the dedication and the technical support provided by the Consultant, M/s ITEC Engineering Ltd.

Finally, we wish to acknowledge and thank the team involved in Cost Estimation validation workshop for their valuable contributions: Eng. Monicah Wangare, Eng. Julius Nginya, Eng. Albert Semutwa, Eng. James Kariuki, Eng. Nicholas Chelugo, Eng. Musa Murunga, Eng. Gitonga Njonjo, Kenneth K. Muriuki, Eng. Julliette Murugi and Abdiaziz Hassan.

Contents

Foreword	iii
Acknowledgement	v
Abbreviations and Acronyms.....	ix
Glossary of Terms	xi
1. Introduction.....	1
1.1 Purpose of the Manual	1
1.2 Application of the Manual	1
2. Contents of the Manual	2
2.1 Work items and coding.....	2
2.2 Cost configuration	2
2.3 Price list and source	3
2.4 Haulage cost	6
2.5 Unit quantity and productivity	8
2.6 Indirect work costs	8
2.7 Overheads and Profit.....	8
2.8 Revision Highlights	9
3. Unit Rates List	11
APPENDICES	
Appendix 1 : Work Items and Coding.....	18
Appendix 2 : Price List Labour, Machinery, Material (Coast Region).....	26
Appendix 3 : Unit Cost Calculation Table (Coast Region)	31
Appendix 4 : Standard Drawings.....	272

Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
CBR	California Bearing Ratio
JICA	Japan International Cooperation Agency
KeNHA	Kenya National Highways Authority
KeRRA	Kenya Rural Roads Authority
KNBS	Kenya National Bureau of Statistics
KRB	Kenya Roads Board
KURA	Kenya Urban Roads Authority
KWS	Kenya Wildlife Service
MDD	Maximum Dry Density
MoTIHUD & PW	Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works
MTD	Mechanical and Transport Department
PPRA	Public Procurement Regulatory Authority
PVC	Polyvinyl Chloride
RAs	Road Authorities
RMS	Road Management System
VAT	Value Added Tax

Glossary of Terms

Abutment	Structure support to bridge deck and retains the road embankment.
Adhesion	Sticking quality, for example, holding aggregate to the binder in chip sealing.
Aggregate	Crushed local rock or stone.
Apron	Floor of concrete, masonry or stone at the inlet or outlet of a culvert or waterway to prevent scour.
Asphalt Concrete	Road construction material usually comprising a mixture of bitumen and aggregate, also known as hot-mix or hot-rolled asphalt.
Base Course	The main structural element of the pavement, between the surface course and subbase.
Benching	A stepped platform cut in an embankment to prevent earth slipping and improve slope stability. Can also be used as a stepping to provide a level base for additional fill material.
Berm	A low ridge or bund of soil to collect or redirect surface water.
Binder	An adhesive material, usually bitumen or bitumen emulsion, used to seal the road surface, also providing a waterproof layer to receive and hold aggregate. The most common binders are bitumen based. A binder is also used to hold aggregate together in bituminous mixtures.
Binder Course	The layer forms part of the bituminous surfacing immediately below the wearing course.
Bitumen	Bitumen (called asphalt cement in the US) is a black to dark brown sticky material composed principally of high-molecular-weight hydrocarbons. Most bitumen is derived from the distillation of crude oil. Bitumen is a thermoplastic material that gradually liquefies when heated.
Borrow Pit	An excavation outside the road limits from which suitable material is obtained, usually for earthwork or re-gravelling operations.
Box Culvert	A culvert of rectangular cross-section, usually constructed in reinforced concrete.
Bridge	A structure with a span of 6 metres or more providing a means of transit above land and/or water or above an obstruction, whether natural or artificial.

Camber (Cross Fall)	The transverse slope applied to the carriageway on a section of straight alignment.
Causeway	Low-level structure constructed across streams or rivers with openings to permit water to pass below road level.
Carriageway	The part of the road used by vehicular traffic.
Catchment Area	The area from which water runs off by gravity to a collecting point.
Catchpit	A covered, accessible chamber with a sump for collection of silt forming part of the drainage system and permitting inspection and maintenance of underground drainage pipes.
Centre-line	The middle of the carriageway, normally marked with a yellow dashed line on a paved road.
Compaction	Compacting embankment by roller to increase the density of soil what composes embankment body. It causes to improve mechanical properties of soil.
Cross-fall	The transverse gradient or fall across a formation or pavement.
Cross-section	Section through the road construction at right angles to the centre-line.
Crown	The highest part of a cambered surface, usually on or near the centre-line.
Culvert	A duct, usually rectangular or circular, for carrying surface water under the road.
Cut (Cutting)	Excavation in natural ground usually with graded slopes.
Cut-off Drain	A drain cut to intercept surface water flowing from adjacent land and to prevent it reaching a pavement or other prepared surface.
Cut Slope	A soil plane constructed at an angle to the horizontal.
Cycleway	The track which is mainly used for bicycle traffic. The track is separated with other parts of road by kerb stone or its similar structures.
Ditch (Drain)	A long narrow excavation designed or intended to collect and drain off surface water.

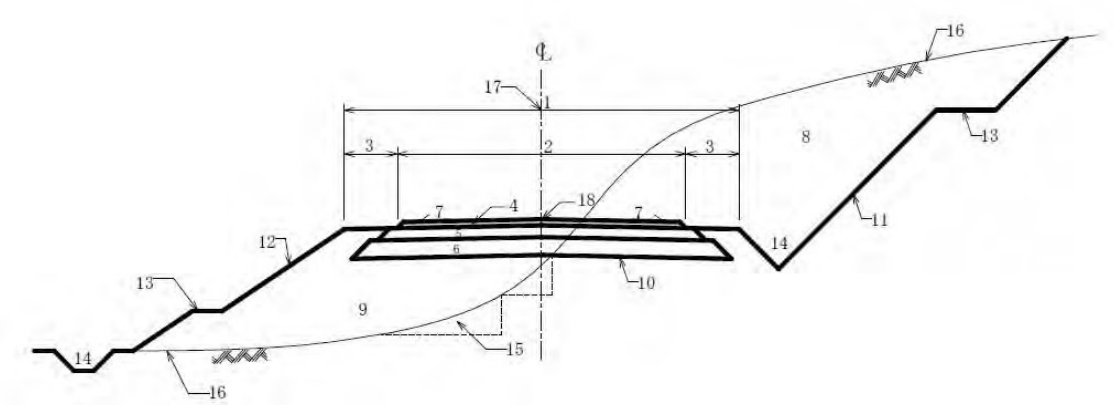
Drainage	The interception and removal of ground and surface water by artificial or natural means.
Drainage Channel	A waterway or gutter to carry away surface water.
Drift or Ford	A stream or river crossing at bed level over which the stream or river water can flow.
Earthworks	General term of construction works involving soil and rocks (e.g. excavation, loading, hauling, spreading and compaction).
Embankment Slope	An artificially constructed soil plane at an angle to the horizontal.
Fill (Embankment)	Earthworks constructed below the pavement raising the road above the surrounding natural ground level.
Footbridge	The overpass bridge crossing carriageway/railway to ensure the safety of pedestrian and smooth vehicle traffic.
Footpath	The track which is mainly used for pedestrian. The track is separated with other parts of road by kerb stone or its similar structures.
Gabion	The steel mesh cage filled with cobble stone or crushed stone. This is mainly used for revetment and foot protection.
Gravel	A non-cohesive, coarse granular material, resulting from natural disintegration of rock with or without finer material. In general, the particles are irregular or flaky. It is used as material of surface course and to correct loss of shape, ruts, potholes and erosion gullies.
Guardrail	A safety barrier on embankment or river crossing
Gutter	A shallow waterway provided at the edge of the road to carry surface water longitudinally.
Headwalls	The walls located on the top of outlet/inlet of culvert. The walls of inlet direct the flow into the culvert, while the walls of outlet provide a transition from the culvert to the outlet channel. Headwalls also protect the embankment from erosion by flood waters.
Inlet	The point at which surface water enters a pipe culvert or box culvert.
Invert	The lowest point of the internal cross section of a ditch or culvert.
Lane	The width of carriageway required to accommodate one line of traffic.
Manhole	Accessible chamber with a cover forming part of the drainage system and permitting inspection and maintenance of underground drainage pipes.

Mitre Drain	Short, open, skew ditches used to remove water from the roadside ditches or gutters. Use of this reduces the necessary size of the side ditches and minimizes the velocity of water and thereby the risk of erosion.
Original Ground Level	Line of natural ground.
Outfall	The point at which water discharges from a pipe or box culvert.
Paved Road	For the purpose of this manual a paved road is a road with a concrete surface, concrete block, bituminous surface or surface dressing.
Pavement	The road structure above the formation, designed to spread the loading over the base and subbase.
Pipe Culvert	A culvert of circular cross-section, usually constructed in pre-cast concrete.
Premix	Premix is a paving material manufactured by mixing aggregates, filler and bitumen. Most premix is mixed and placed hot. Premix is used in the construction of wearing course, binder courses and base courses.
Prime Coat	A coating of low viscosity binder applied to a surface of stabilised or naturally compacted soil before sealing or paving.
Road Reserve (Right-of-way)	The area within the road limits over which members of the public have the right to pass and re-pass.
Road Furniture	Road or street furniture e.g., traffic sign, traffic board, traffic signal, lane marking, guardrail, street light, etc.
Roadway	The portion of a road including shoulders for vehicular use.
Scour Checks	The structures to prevent scouring of drains. Simple scour checks may be constructed of wood pegs or stones. All scour checks should have an apron downstream built of stones or grass turves pinned to the ditch invert with wooden pegs.
Shoulder	Paved or unpaved part of the road next to the outer edge of the pavement. The shoulder provides side support for the pavement and allows vehicles to stop or pass in an emergency.

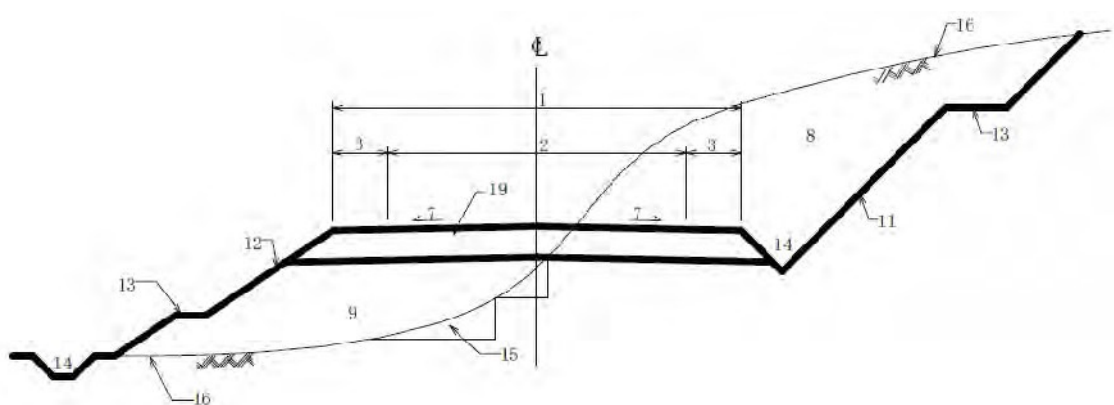
Side Drain	Drain beyond the shoulders, parallel to the centre-line, to take the run-off from the road surface.
Slope	A natural or artificially constructed soil plane at an angle to the horizontal.
Sub-base	The layer of material between the base course and the subgrade.
Subgrade	Upper layer of the soil that supports the pavement
Superelevation	Raising outside edge level of the road above the inner edge level on curves to reduce the effect of centrifugal forces and minimize sliding, skidding, tipping and rolling over of vehicles through curves.
Surfacing	Top layer of the pavement. Consists of wearing course, and sometimes a base course or binder course.
Surface Dressing	A sprayed or hand-applied film of bitumen followed by the application of a layer of stone chippings, which is then rolled.
Tack Coat	Asphalt material to bond lower layer (asphalt material or cement) and upper layer (asphalt mixture). It is sprayed on surface of lower layer.
Traffic Lane	The portion of the carriageway defined by road marking for the movement of a single line of vehicles.
Transverse Joint	Joint at right angles to the road centre-line.
Transverse Joint Taper	Slope or ramp of asphalt mix at the end of a freshly laid asphalt course.
Unpaved Road	For the purpose of this manual an unpaved road is a road with a gravel or earth surface.
Wearing Course	The part of the road surface in contact with traffic wheels.
Wing-wall	Retaining wall at a bridge abutment to retain and protect the embankment fill behind the abutment.

Cross Section

The typical cross sections of paved, unpaved and urban roads are as follows:



Paved Road



Unpaved Road

1. Roadway	2. Carriageway	3. Shoulder	4. Surfacing	5. Base
6. Sub-base	7. Camber (Cross Fall)	8. Cut	9. Embankment	10. Subgrade
11. Cut Slope	12. Embankment Slope	13. Berm	14. Side Ditch	15. Benching
16. Natural Ground Level	17. Centre-line	18. Marking	19. Gravel	20. Footpath
21. Road Reserve	22. Pavement	23. Side Ditch	24. Boundary Stone	

I. Introduction

The Kenya Vision 2030 is the long-term vision which aspires that Kenya becomes a globally competitive and prosperous country by the year 2030. The plan is anchored on three pillars: The Economic, the Social and the Political. Infrastructure is considered one of the foundations and enablers of macroeconomic stability to support the three main pillars. The Third Medium Term Plan 2018 – 2022 (MTP III), which is currently under implementation, outlines the role of the sector in providing cost-effective first-rate infrastructural facilities and services for the 21st century. The roads sub-sector falls under infrastructure, which is one of the foundations of the three pillars, and its programmes and projects include expansion and maintenance of roads.

In line with the above, the Cost Estimation Manual (CEM) for Road Maintenance Works was developed by the Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works (MoTIHUD&PW), with support from the Japanese International Cooperation Authority (JICA) and officially published in November 2011. It provides a basis for accurate and cost-effective construction and maintenance of roads as envisaged in MTP III. Subsequently, the 2011 CEM was updated in 2017 and 2019. The CEM for performance-based contracts was developed in 2015.

I.1. Purpose of the Manual

This manual gives instructions for estimating the cost of road maintenance works, by considering all inputs. This is to provide a standardized procedure for pricing road activities in Kenya, to ensure uniformity in planning and evaluation of the rates by contractors, road agencies, county road departments and engineers.

The manual forms a crucial part of developing a best practice standard for Road Agencies (RAs) to understand the pertinent issues in preparing cost-effective estimates for road maintenance projects. The cost estimation manual need to be updated continuously as per changing work methodologies and physical conditions.

I.2. Application of the Manual

This manual is to be applied in the preparation of the Engineer's cost estimate for tender documentation by procurement entities and provides a benchmark for the evaluation of bidding prices.

The manual shall also be used for the formulation of annual work plans by the Road Agencies and as an auditing tool for ongoing road works.

It can also be used as a reference for bidders to prepare their bidding documents while considering their unique cost settings.

2.Contents of the Manual

2.1. Work items and coding

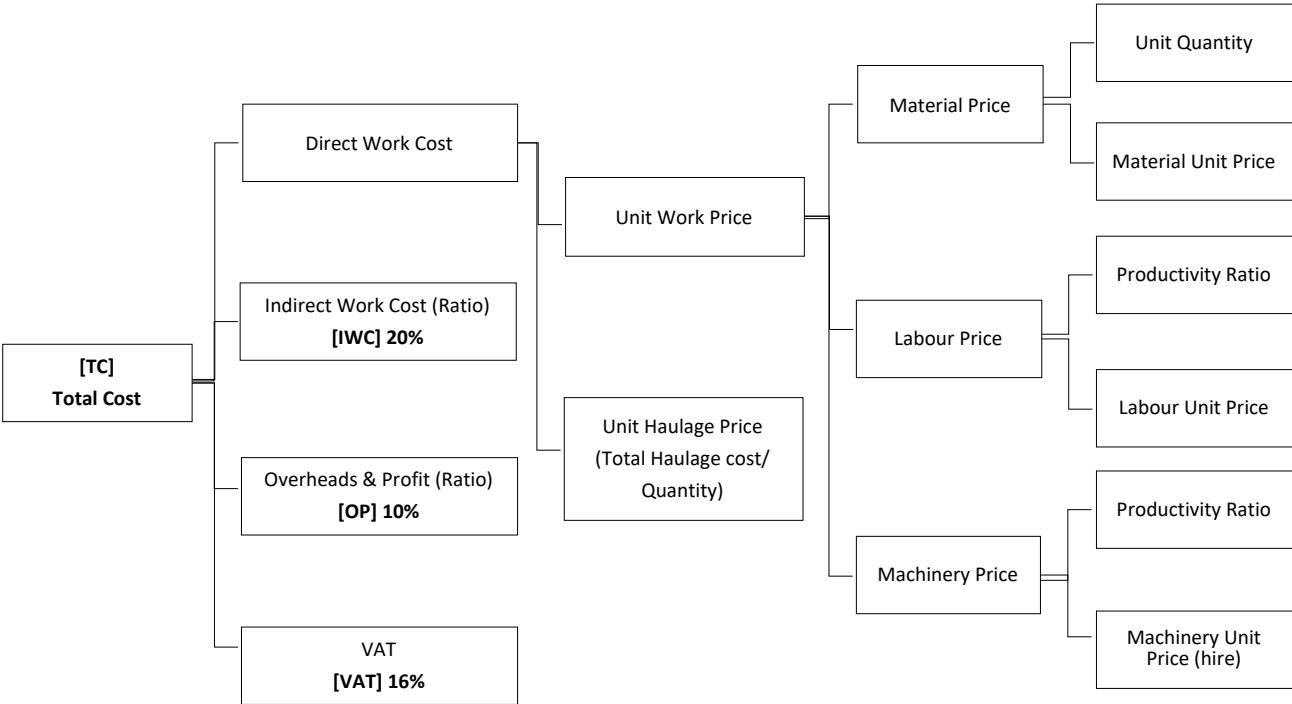
Work items covered in this manual are shown in Appendix I. These are the common types of works which are widely implemented in road maintenance works in Kenya.

The coding for each work item is derived from the Road Management System (RMS), and categorized in accordance with the Standard Specifications for Road and Bridge Construction (1986).

2.2. Cost configuration

Road works consist of various work items that are aggregated into a work package. The total cost of any work package is structured in the formula shown in Figure 21 below.

Figure 1: Cost configuration



$$TC = \sum (Q \times UP) \times (1 + IWC) \times (1 + OP) \times (1 + VAT)$$

Direct Work Costs are the accumulation of all necessary input costs for the execution of each work item. This is the product of the quantity by its unit price, while the unit haulage price is considered separately. The combination of Unit Work Price (a pure work price assuming that all the resources are on site) and Unit Haulage Prices constitute the Unit Price. This takes care of the transportation costs of work items.

Indirect Work Costs are costs related to management and administration. It is given by the ratio of the Direct Work Costs.

Overheads and profits are also given by the ratio of Direct Work Costs. Value-added tax (VAT) is a percentage determined by taxation regulations.

2.3. Price list and source

Material, Labour and Machinery unit prices used for cost estimation by procurement entities are basically derived from official price indices given by government entities. They are open to the public and based on nationwide market surveys. Hence, they can be assumed to be the average prices in Kenya.

- Material Price: Material Price List from Kenya National Bureau of Statistics (KNBS).
- Labour Rates: The Regulation of Wages (General) (Amendment) Order, The Labour Institution Act, Ministry of Labour.
- Machinery Hire Rates: The Equipment Hire Rate List from Mechanical and Transport Department, Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works.

Labour, Material and Machinery rates are provided for eight regions across the country in the CEM 2022.

The official prices are revised periodically. The prices may be updated on an ad-hoc basis when substantial changes take place during the fiscal year (e.g., the case of high inflation or embargo).

When some of the material and machinery prices are obsolete or not covered in the official price indices, average market prices acquired from surveys by manual administrators or provisional prices by referring to similar items are used. Those prices should be revised immediately once the official prices are available.

All prices are also coded based on the RMS coding system. The prices of material, labour and machinery used in the manual with their sources are shown in Appendix 2.

Selection of the Survey Areas

The survey areas constituted eight (8) regions decided upon collectively by the Consultant and team from KRB. In total, 22 towns and cities were surveyed for the 2022 CEM.

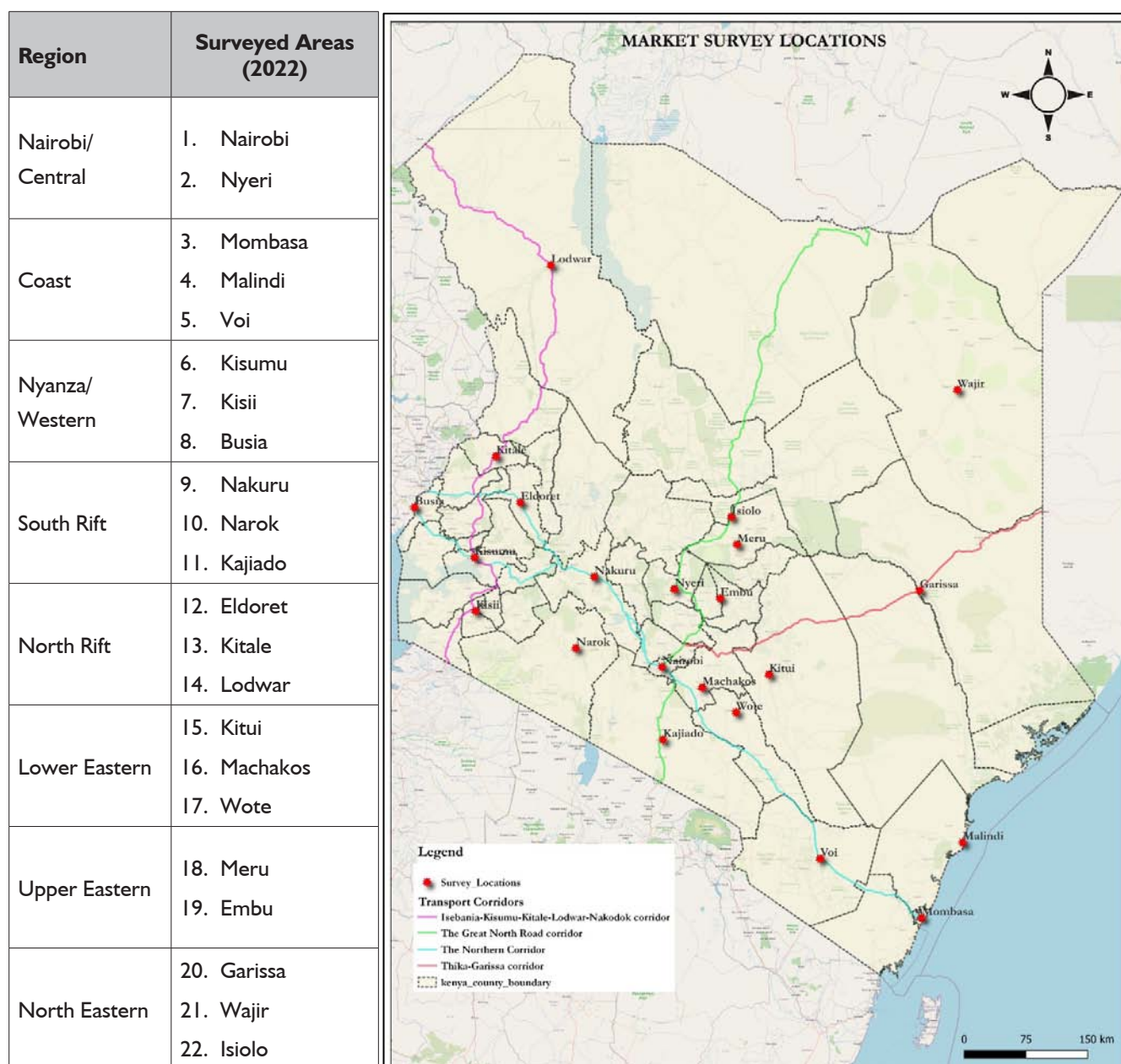


Figure 2: Market survey locations

Source map: Google Earth

Survey Methods

Primary Data Collection

In each of the selected cities/towns, information was obtained by visiting wholesale suppliers, major hardware shops, warehouses, road contractors, items manufacturers etc.

Online market surveys were also employed to retrieve information from available price lists on the internet and verified during the field surveys.

Secondary Data Collection

The following official rates from relevant government bodies and other recognised organisations were obtained and used to update the CEM basic rates.

Table 1: Sources of the secondary data

Item	Source	Document
Labour rates	Laws of Kenya	Regulation of Wages (General) (Amendment) Order, 2022 Legal Notice No. 125 of 2022t
Material	Kenya National Bureau of Statistics	KNBS Price list
Fuel rates	Energy and Petroleum Regulatory Authority	Pump Price list
Machinery	Mechanical and Transport Department (MTD)	MTD Hire Rate List

Unit Price Analysis

Labour

The contractors were selected based on the work they have done with the road agencies.

The unit rates selected were obtained from Contractors. However, unit rates set in the Regulation of Wages (General) (Amendment) Order, 2022 were adopted in cases where the average wage rates from the market survey were comparatively lower.

Priority	Survey Data Source	Target Trade
1.	Contractor	Road Construction
2.	Documented Labour Law	Building and Construction

Material

The selection of suppliers in this category was done at random i.e., based on the availability of the material. It was done through visits to contractors and the Road Agencies regional headquarters, the internet, phone and email communication, as well as recommendations.

The procedure to determine the unit price went as follows:

1. The price from the market survey was considered first;
2. The prices in the market survey were collected from a minimum of three suppliers. Then, the prices from the suppliers were averaged to provide one price from the market. Prices which were too low and too high were not considered in the average;
3. If an item was not available in the market, its price was picked from the previous 2019 price list and appropriately factored; and,
4. In instances where the unit price selected from the steps above had increased highly from the price in the 2019 survey, prices from all three sources were compared and the most logical price was selected.

Priority	Source of Data
1.	Market Survey
2.	Kenya National Bureau of Statistics (KNBS)
3.	Road Authorities e.g. KeNHA, KURA, KeRRA

Equipment

The suppliers for hiring equipment were also selected at random; either through the internet or recommendations from the regional RA project team leaders and contractors.

The prices were compared between the two sources of data but prices from the market survey were prioritised.

Priority	Source of Data
1.	Market Survey
2.	Mechanical and Transport Department (MTD) in MoTIHUD & PW

2.4. Haulage cost

Site location is a major parameter to determine the unit price, therefore the haulage cost to transport material or equipment should be carefully estimated. In this manual, haulage cost is estimated using the criteria in Table 2-2.

The calculated total haulage cost is then divided by a given quantity of the work item and added to unit work price to make a unit cost of the work.

If a different quotation for haulage is available, it may be used regardless of the aforementioned equation.

Table 3 : Estimation of Haulage Price

Type of Vehicle:	(specify)
Vehicle price per hour (or dry hire rate) = A	Ksh/hr
Fuel price per hour, B = C/D*E	Ksh/hr
Fuel cost per litre = C	Ksh/litre
Fuel consumption rate = D	km/litre
Average speed during transport = E	km/hr
Driver wage per hour, F = G/8hr	Ksh/hr
Wage per day = G	Ksh/day
Turnboy wage per hour, H = I/8hr	Ksh/hr
Wage per day = I	Ksh/day
Total price per hour of transport, J = A+B+F+H	Ksh/hr
Distance of transport (one way) = K	km
Frequency of transport (no. of round trip) = L	times
Distance of transport (by round trip), M = 2*K	km
Total Distance of transport, N = L*M	km
Total time of Transport, O = N/E	hr
Total Haulage Price, P = J*O	Ksh

2.5. Unit quantity and productivity

Unit quantity of material (the amount of material used per unit of work), labour productivity (the number of people worked per unit of work), and machinery productivity (the number of hours/days of machinery operation needed per unit of work) are determined from the following references:

- Ministry of Transport and Communications, Standard Specification for Road and Bridge Construction, 1986;
- Standard drawings; and,
- Average productivity rates from site surveys and the engineers' past experiences with input from JICA.

2.6. Indirect work costs

Indirect work costs include the following items:

- Human Resource Management costs (e.g., recruiting, staff welfare, transportation, insurance, uniforms);
- Site staff allowances;
- Management cost (e.g., site office maintenance, office equipment, communication, transportation);
- Safety measures; and,
- Social charges (e.g., local taxes and public charges, welfare).

2.7. Overheads and Profit

Overheads and Profit include the following items:

- Head office staff salaries and allowances;
- Head office management costs (e.g., office maintenance, office equipment, communication, transportation);
- Corporate social charges (e.g., insurance, tax and public charges, welfare);
- Research and development;
- Advertisement and publicity;
- Depreciation costs for fixed assets; and,
- Profit margin (bonuses, dividends to shareholders, internal reserves).

Since the precise estimation of the two items above is difficult, the costs are provided as a ratio of the total direct work cost.

2.8. Revision Highlights

2011

1. Developed and published using Japanese productivity rates for labour, machinery and materials multiplied by a factor.
2. Unit rates used are for only two regions i.e. Nairobi, Mombasa and Kisumu as one region and “all other areas” as the other.
3. Unit prices were obtained from the Kenyan market.

2017

1. Update of Unit prices for Nairobi, Mombasa and Kisumu and All other areas.
2. Update of quantities for the following work items:
 - Gabion Installation; and,
 - Pothole Repair.
3. Miscellaneous costs are adjusted as follows:
 - 20% for Concrete works, Structural Works and complicated street furniture works reduced to 10%; and,
 - 10% for Clearing, cleaning, earthwork, base and surfacing works and simple street furniture works reduced to 5%.

2019

1. Update of unit prices for Nairobi, Mombasa and Kisumu.
2. Update of unit rate calculation tables for the following:
 - Labour-based works: Ditch cleaning (Manual) and culvert cleaning;
 - On-carriageway works including pothole repair, headwall repair, re-gravelling and road marking; and,
 - Cement/ lime mixing.
3. Addition of guardrail repair.
4. Indirect costs were reduced from 30% to 20%.

2022

1. Update of unit prices collected from eight (8) regions (19 towns and 3 cities) i.e. Nairobi/ Central, Coast, Nyanza/Western, North Rift, South Rift, Upper Eastern, Lower Eastern and North Eastern.
2. Update of productivity rates for the following equipment:
 - Water tanker;
 - Motor grader; and,
 - Pneumatic roller.

Unit Rates List

3. Unit Rates List

4. Site Clearance and Topsoil Stripping

				Coast Region		
					Kshs	
No	Work Category	Code	Work Item Name	Unit	Unit Price	Unit Price (indirect cost, overhead/profit included)
1	Bush Clearing	04.50.001	Mechanical mowing	m ²	5.2	6.9
2		04.50.002	Grass cutting (manual)	m ²	3.6	4.8
3		04.50.003	Heavy bush clearing	m ²	17.1	22.6
4		04.50.004	Light bush clearing	m ²	9.6	12.7
5		04.50.005	Pruning of tree branches	m ²	103.0	136.0
6		04.50.006	Tree cutting and stump removal (200 -450 mm)	No	213.0	281.2
7		04.50.007	Tree cutting and stump removal (>450 mm)	No	1,918.0	2,531.8
8	Site Clearing and Backfill	04.50.008	Clearing obstructions (mechanical)	m ²	35.0	46.2
9		04.50.008a	Clearing obstructions (manual)	m ³	251.0	331.3
10		04.50.009	Stripping and grubbing (mechanical)	m ²	101.0	133.3
11		04.50.009a	Stripping and grubbing (manual)	m ²	171.0	225.7
12		04.60.001	Clearing trees, hedges, bushes, vegetation and deleterious materials (mechanical)	m ²	76.0	100.3
13		04.60.001a	Clearing trees, hedges, bushes, vegetation and deleterious materials (manual)	m ²	81.0	106.9
14	Concrete Demolition	04.50.010	Excavate remove & disposal of concrete structures	m ³	551.0	727.3
15	Top Soil Stripping	04.80.002	Removal of overburden	m ³	253.0	334.0
16	Pipe Culvert Removal	04.60.005	Removal of cracked small pipe culverts below 600mm	m	364.0	480.5
17		04.60.005a	Removal of cracked large pipe culverts above 600mm	m	547.0	722.0

5. Earth Works

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
18	Material Filling	05.50.006	Fill in soft material and compact	m ³	567.0	748.4
19		05.50.006a	Fill in soft material and compact (soil purchased)	m ³	882.0	1,164.2
20		05.50.007	Fill in hard material and compact	m ³	692.0	913.4
21		05.50.007a	Fill in hard material and compact (soil purchased)	m ³	1,196.0	1,578.7
22	Material Cutting	05.50.008	Cut to spoil in soft	m ³	508.0	670.6
23		05.50.008a	Cut to spoil in soft (mechanical)	m ³	221.0	291.7
24		05.50.009	Cut to spoil in hard	m ³	959.0	1,265.9
25		05.50.009a	Cut to spoil in hard (mechanical)	m ³	441.0	582.1
26	Concrete Demolition	05.50.012	Rock fill to swamp	m ³	3,158.0	4,168.6
27		05.50.125	Rock fill to embankment construction	m ³	3,456.0	4,561.9
28	Planting	05.50.014	Grassing	m ²	359.0	473.9
29	Pipe Culvert Replacement	05.60.012	Compaction of subgrade in cut	m ²	37.0	48.8
30		05.60.014	Compaction of subgrade in fill	m ³	1,508.0	1,990.6
31		05.60.016	Compaction of original ground level	m ³	49.0	64.7
31a		05.60.016a	Compaction of the 300 mm below formation level in cutting to 100% MDD (AASHTO T99)	m ³	1,659.0	2,189.9

7. Excavation and Filling for Structure

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
32	Material Excavation for Structures	07.50.001	Excavate for structure in soft material (manual)	m ³	508.0	670.6
33		07.50.001a	Excavate for structure in soft material (mechanical)	m ³	221.0	291.7
34		07.50.002	Excavate for structure in hard material (manual)	m ³	959.0	1,265.9
35		07.50.002a	Excavate for structure in hard material (mechanical)	m ³	441.0	582.1
36	Gabion	07.70.004	Gabion Installation	m ²	609.0	803.9
37		07.70.005	Rock fill to Gabions	m ³	2,151.0	2,839.3
38	Stone Pitching	07.70.001	Stone pitching	m ²	1,589.0	2,097.5

8. Culverts and Drainage Works

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
39	Ditch Cleaning	08.50.002a	Ditch cleaning - mechanical	m	27.0	35.6
40		08.50.002	Ditch cleaning - manual	m	17.1	22.6
41	Culvert Cleaning	08.60.002	Small culvert cleaning-partially blocked-below 450mm	m	402.0	530.6
42		08.60.003	Medium culvert cleaning-partially blocked-600mm	m	308.0	406.6
43		08.60.004	Large culvert cleaning-partially blocked-900 mm and above	m	214.0	282.5
44		08.50.025	Manhole cleaning	No	748.0	987.4
45		08.50.016	Gulley pot cleaning	No	143.0	188.8
46		08.50.009	Covered (slotted) lined drain cleaning	m	85.0	112.2
47		08.50.005a	Ditch/mitre drain excavation in soft (mechanical)	m ³	292.0	385.4
48		08.50.005	Ditch/mitre drain excavation in soft (manual)	m ³	292.0	385.4
49		08.50.005b	Ditch/mitre drain excavation in hard (mechanical)	m ³	452.0	596.6
50		08.50.005c	Ditch/mitre drain excavation in hard (manual)	m ³	1,601.0	2,113.3
51	Pipe Culvert Installation	08.60.021	Culvert installation-300mm with surround	m	6,796.0	8,970.7
52		08.60.020	Culvert installation-300mm without surround	m	2,388.0	3,152.2
53		08.60.023	Culvert installation-450mm with surround	m	10,897.0	14,384.0
54		08.60.022	Culvert installation-450mm without surround	m	4,804.0	6,341.3
55		08.60.025	Culvert installation-600mm with surround	m	15,187.0	20,046.8
56		08.60.024	Culvert installation-600mm without surround	m	5,371.0	7,089.7
57		08.60.027	Culvert installation-900mm with surround	m	22,356.0	29,509.9
58		08.60.026	Culvert installation-900mm without surround	m	6,569.0	8,671.1
59		08.60.028	Culvert installation-1200mm with surround	m	40,596.0	53,586.7
60		08.60.029	Culvert installation-1200mm without surround	m	16,276.0	21,484.3
61		08.60.030	Excavate in soft material for culverts	m ³	292.0	385.4
62		08.60.031	Excavate in hard material for culverts	m ³	1,601.0	2,113.3

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
63	Headwall Construction	08.60.019	Headwall construction for 450mm pipe culvert	No	32,095.5	42,366.0
64		08.60.019a	Headwall construction for 600mm pipe culvert	No	37,586.4	49,614.1
65		08.60.019b	Headwall construction for 900mm pipe culvert	No	49,292.8	65,066.5
66		08.60.019c	Headwall construction for 1200mm pipe culvert	No	66,746.9	88,105.9
67	Manhole installation	08.50.024	Manhole construction less than 1m	No	33,946.0	44,808.7
68		08.50.024a	Manhole construction more than 1m	No	57,968.0	76,517.8
69	Gulley Pot installation	08.50.015	Gulley pot construction	No	10,608.0	14,002.6
70	Drain Lining	08.50.032	Lay drain lining with concrete	m ²	1,932.0	2,550.2
71		08.50.022a	Laying of dressed stones	m ²	1,893.0	2,498.8
72		08.50.022	Laying of side slabs	m ²	2,900.0	3,828.0
73		08.70.036	Laying of 300mm invert block drain	m	1,801.0	2,377.3
74		08.70.037	Laying of 750mm invert block drain	m	3,674.0	4,849.7

9. Passage of Traffic

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
75	Traffic Control	09.50.004	Traffic Control	Day	1,848.0	2,439.4
76		09.50.005	Watchman	No	1,773.0	2,340.4
77		09.50.006	Watering	m ²	14.0	18.5

10. Grading and Gravelling Works

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
78	Grading	10.50.001	Heavy grading without watering or compaction	m ²	6.1	8.1
79		10.50.002	Heavy grading with watering and compaction	m ²	10.7	14.1
80		10.50.003	Light grading	m ²	5.0	6.6
81		10.50.004	Reshaping	m ²	14.4	19.0
82		10.50.005	Dragging	m ²	14.4	19.0
83	Gravelling	10.60.001	Regravelling	m ³	1,683.0	2,221.6
84		10.60.001a	Regravelling without watering	m ³	1,666.0	2,199.1

11. Paved Roads - Shoulder Maintenance and Repairs

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
85	Shoulder Rebuilding	11.50.001	Shoulder grading	m ²	33.0	43.6
86		11.50.002	Shoulder repairing	m ²	33.0	43.6
87	Shoulder Gravelling	11.50.003	Shoulder gravelling with natural gravel	m ³	1,708.0	2,254.6
88		11.50.003a	Shoulder gravelling with quarry waste	m ³	2,490.0	3,286.8

12. Natural Material Base and Subbase

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
89	Pavement Removal	12.70.001	Scarify existing pavement to form subbase	m ³	928.0	1,225.0
90	Subbase/Base Rebuilding	12.50.001	Handpacked stone paving	m ³	5,216.0	6,885.1
91		12.50.002	Provide, place and compact quarry waste	m ³	6,385.0	8,428.2
92		12.50.003	Provide, place, spread and compact natural gravel	m ³	1,705.0	2,250.6

13. Graded Crushed Stone Base and Subbase

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
93	Graded Crushed Stone	13.50.001	Graded Crushed Stone for subbase	m ³	2,354.0	3,107.3
94		13.60.001	Graded Crushed Stone for base	m ³	2,354.0	3,107.3

14. Cement and Lime Treated Subgrade, Subbase and Base

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
95	Cement/Lime Stabilization	14.50.001	Cement stabilization	m ³	2,727.0	3,599.6
96		14.50.002	Lime stabilization	m ³	3,922.0	5,177.0
97		14.50.003	Cement/lime mixing	m ³	67.0	88.4
98		14.50.004	Curing and protection of treated layers	m ²	64.6	85.3

15. Bituminous Surface Treatment & Surface Dressing

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
99	Prime Coat	15.50.002	Prime Coat (MC-30 cutback bitumen)	litre	208.0	274.6
100	Tack Coat	15.50.003	Tack Coat (grade bitumen cutback)	litre	230.0	303.6
101		15.50.003a	Tack Coat (bitumen emulsion)	litre	211.0	278.5
102	Surface Dressing	15.70.001	Seal coat	litre	317.0	418.4
103		15.60.002	Provide and roll 3/6 mm precoated chipping	m ³	13,121.0	17,319.7
104		15.60.003	Provide and roll 6/10 mm precoated chipping	m ³	15,818.0	20,879.8
105		15.60.004	Provide and roll 10/14 mm precoated chipping	m ³	16,973.0	22,404.4
106		15.60.005	Provide and roll 14/20 mm precoated chipping	m ³	18,705.0	24,690.6

16. Bituminous Mixes

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
107a	Pavement Repairing	16.50.001a	Pothole Cutting and Cleaning	m ³	2,027.0	2,675.6
107		16.50.001	Pothole patching - hot mix	m ³	29,793.0	39,326.8
108		16.50.002	Pothole patching - cold mix	m ³	50,466.0	66,615.1
109		16.50.004	Crack sealing	m	191.0	252.1
110		16.60.001	Asphalt concrete for surfacing - hot mix.	m ³	30,357.0	40,071.2
111		16.70.001	Base repair - Dense Bitumen Macadam (DBM)	m ³	30,357.0	40,071.2
112	Milling and Paving	16.80.010	Milling the existing bituminous layer to spoil	m ³	3,300.0	4,356.0
113		16.80.015	Milling the existing bituminous layer for reuse	m ³	13,058.0	17,236.6

17. Concrete Works

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
114	Concrete Work	17.60.001	Concrete work (class 15/20)	m ³	12,291.0	16,224.1
115		17.60.002	Concrete work (class 20/20)	m ³	13,749.0	18,148.7
116		17.60.002a	Concrete work (class 25/20)	m ³	15,385.0	20,308.2
117	Formwork	17.60.003	Vertical formwork class F2 finish	m ²	2,017.0	2,662.4
118		17.60.004	Horizontal formwork class F2 finish	m ²	1,932.0	2,550.2
119	Reinforcement	17.80.004	Reinforcement work (below 16mm)	ton	156,103.0	206,056.0
120		17.80.005	Reinforcement work (above 16mm)	ton	165,131.0	217,972.9

20. Road Furniture Repair and Maintenance

No	Work Category	Code	Work Item Name	Unit	Unit Price (Kshs)	Unit Price (indirect cost, overhead/profit included)
121	Boundary posts	20.50.001	Road reserve boundary posts	No	2,938.0	3,878.2
122		20.50.004	Edge marker posts	No	3,847.0	5,078.0
123	Road Marking	20.50.007	Road markings - white paint	m ²	1,399.0	1,846.7
124		20.70.011	Road markings - white thermoplastic material	m ²	2,607.0	3,441.2
124a		20.70.011a	Road markings on surface dressed pavement- white thermoplastic material	m ²	2,897.0	3,824.0
125		20.50.006	Road markings - yellow paint	m ²	1,399.0	1,846.7
126		20.70.010	Road markings - yellow thermoplastic material	m ²	2,787.0	3,678.8
126a		20.70.010a	Road markings on surface dressed pavement- yellow thermoplastic material	m ²	3,095.0	4,085.4
127		20.50.107	Road marking black paint	m ²	1,429.0	1,886.3
128	Road Sign Erection	20.70.002	Warning signs	No	21,991.0	29,028.1
129		20.70.005	Priority, prohibitory or mandatory signs	No	21,991.0	29,028.1
130		20.70.004	Standard informatory signs	No	21,733.0	28,687.6
131		20.70.006	Non-standard informatory signs	No	36,743.0	48,500.8
132	Kerb Installation	20.50.012	Kerbs	m	1,903.0	2,512.0
133	Kilometre marker post Installation	20.50.013	Kilometre marker posts	No	7,784.0	10,274.9
134	Bollard Installation	20.50.017	Concrete bollards	No	3,330.0	4,395.6
135		20.50.021	Steel bollards	No	2,282.0	3,012.2
136	Reflective Stud Installation	20.50.019	Reflective studs	No	800.0	1,056.0
137	Microtunneling	20.60.002	Microtunneling for a 150mm diameter PVC (poly-vinyl chloride) duct	m	68,918.0	90,971.8
138		20.60.002a	Horizontal drilling	m	41,930.0	55,347.6
139	Street light Installation	20.60.017	Street lighting pole (7.6m)	No	82,868.0	109,385.8
140		20.60.018	Street lighting pole (10m)	No	132,303.0	174,640.0
141		20.60.016	Street lighting control panel	No	84,574.0	111,637.7
142		20.60.315	Electric cable	m	1,441.0	1,902.1
143	Guardrail Repair	20.70.023a	Guardrail Repair Level 1	piece (4m)	7,867.4	10,385.0
144		20.70.023b	Guardrail Repair Level 2	piece (4m)	8,563.0	11,303.1
145		20.70.023c	Guardrail Repair Level 3	piece (4m)	36,664.3	48,396.9

Appendix I: Work Items and Coding

Appendix I: Work Items and Coding

4. Site Clearance and Topsoil Stripping

No	Work Category	Code	Work Item Name	Unit	Description
1	Bush Clearing	04.50.001	Mechanical mowing	m ³	Cut grass by machine along the side of the road or on slopes.
2		04.50.002	Grass cutting (manual)	m ³	Cut grass manually along the side of the road or on slopes.
3		04.50.003	Heavy bush clearing	m ³	Cut, remove and dispose bushes along the side of the road, slopes or alongside ditches.
4		04.50.004	Light bush clearing	m ³	Cut grass by hand from shoulders, slopes, inlet ditches, and side ditches including back slopes, turnouts and culvert outlet.
5		04.50.005	Pruning of tree branches	m ³	Cut, remove and dispose branches of trees along the side of the road, slopes or alongside ditches.
6		04.50.006	Tree cutting and stump removal (200 -450 mm)	No	Cut, remove and dispose whole trees of 200 - 450mm in girth including their stumps along the side of the road, slopes or alongside ditches.
7		04.50.007	Tree cutting and stump removal (>450 mm)	No	Cut, remove and dispose whole trees of above 450mm in girth including their stumps along the side of the road, slopes or alongside ditches.
8	Site Clearing and Backfill	04.50.008	Clearing obstructions (mechanical)	m ³	Mechanically clear any obstruction including boulders and debris out of road reserve.
9		04.50.008a	Clearing obstructions (manual)	m ³	Manually clear any obstruction including boulders and debris out of road reserve.
10		04.50.009	Stripping and grubbing (mechanical)	m ³	Clear site on road reserve mechanically by stripping and grubbing roots.
11		04.50.009a	Stripping and grubbing (manual)	m ³	Clear site on road reserve manually by stripping and grubbing roots.
12		04.60.001	Clearing trees, hedges, bushes, vegetation and deleterious materials (mechanical)	m ³	Clear site on road reserve mechanically by removal of trees, hedges, bushes, vegetation and other deleterious materials.
13		04.60.001a	Clearing trees, hedges, bushes, vegetation and deleterious materials (manual)	m ³	Clear site on road reserve manually by removal of trees, hedges, bushes, vegetation and other deleterious materials.
14	Concrete Demolition	04.50.010	Excavate remove & disposal of concrete structures	m ³	Demolish reinforced or mass concrete structures and cart to spoil or stockpile for re-use.
15	Top Soil Stripping	04.80.002	Removal of overburden	m ³	Remove topsoil to a maximum depth of 200mm.
16	Pipe Culvert Removal	04.60.005	Removal of cracked small pipe culverts below 600mm	m	Excavate, remove and dispose cracked pipe culverts below 600mm in diameter.
17		04.60.005a	Removal of cracked large pipe culverts above 600mm	m	Excavate, remove and dispose cracked pipe culverts above 600mm in diameter.

5. Earth Works

No	Work Category	Code	Work Item Name	Unit	Description
18	Material Filling	05.50.006	Fill in soft material and compact	m ³	Provide, place and compact soft patching material to surface defects or gravel road. It is assumed that soil to be filled is on the site or provided from cut area.
19		05.50.006a	Fill in soft material and compact (soil purchased)	m ³	Provide, place and compact soft purchased patching material to surface defects or gravel road.
20		05.50.007	Fill in hard material and compact	m ³	Provide, place and compact hard patching material to surface defects or gravel road. It is assumed that soil to be filled is on the site or provided from cut area.
21		05.50.007a	Fill in hard material and compact (soil purchased)	m ³	Provide, place and compact hard purchased patching material to surface defects or gravel road.

No	Work Category	Code	Work Item Name	Unit	Description
22	Material Cutting	05.50.008	Cut to spoil in soft	m ³	Cut manually soft material to spoil
23		05.50.008a	Cut to spoil in soft (mechanical)	m ³	Cut mechanically soft material to spoil
24		05.50.009	Cut to spoil in hard	m ³	Cut manually hard material to spoil
25		05.50.009a	Cut to spoil in hard (mechanical)	m ³	Cut mechanically hard material to spoil
26	Rock filling	05.50.012	Rock fill to swamp	m ³	Manually provide and place rock fill to swamp
27		05.50.125	Rock fill to embankment construction	m ³	Manually provide and place rock fill to construct embankment.
28	Planting	05.50.014	Grassing	m ³	Plant grass on the slope and inverts of ditches to reduce scour effects, or on slopes to reduce soil erosion and to improve stability.
29	Pipe Culvert Replacement	05.60.012	Compaction of subgrade in cut	m ³	Trim and compact.
30		05.60.014	Compaction of subgrade in fill	m ³	Compaction of subgrade in fill.
31		05.60.016	Compaction of original ground level	m ³	Compact the top 150 mm layer of existing ground below fills and cuts to 95% MDD (AASHTO T99)
31a		05.60.016a	Compaction of the 300 mm below formation level in cutting to 100% MDD (AASHTO T99)	m ³	Compaction of the top 300mm below formation level in cuts and fills (subgrade) to 100% MDD

7. Excavation and Filling for Structure

No	Work Category	Code	Work Item Name	Unit	Description
32	Material Excavation for Structures	07.50.001	Excavate for structure in soft material (manual)	m ³	Excavate manually soft material for structures.
33		07.50.001a	Excavate for structure in soft material (mechanical)	m ³	Excavate mechanically soft material for structures.
34		07.50.002	Excavate for structure in hard material (manual)	m ³	Excavate manually in hard material for structures.
35		07.50.002a	Excavate for structure in hard material (mechanical)	m ³	Excavate mechanically in hard material for structures.
36	Gabion	07.70.004	Gabion Installation	m ³	Provide and place Macaferri or equivalent gabion boxes (2m * 1m * 1m).
37		07.70.005	Rock fill to Gabions	m ³	Provide and place rock fill to gabions.
38	Stone Pitching	07.70.001	Stone pitching	m ³	Provide stone pitching including grouting of ratio 1:4 cement to mortar.

8. Culverts and Drainage Works

No	Work Category	Code	Work Item Name	Unit	Description
39	Ditch Cleaning	08.50.002a	Ditch cleaning - mechanical	m	Mechanically desilt, shape inlets outfalls, side drains to free flow conditions
40		08.50.002	Ditch cleaning - manual	m	Manually desilt, shape inlets outfalls, side drains to free flow conditions.
41	Culvert Cleaning	08.60.002	Small culvert cleaning-partially blocked-below 450mm	m	Clean culverts of below 450mm in diameter to free flow conditions
42		08.60.003	Medium culvert cleaning-partially blocked-600mm	m	Clean culverts of 600mm in diameter to free flow conditions
43		08.60.004	Large culvert cleaning-partially blocked-900 mm and above	m	Clean culverts of 900mm and above in diameter to free flow conditions
44		08.50.025	Manhole cleaning	No	Remove all silt and debris and wash out manhole to free flow conditions.
45		08.50.016	Gulley pot cleaning	No	Clean siltation and debris from gulley pot to good impoundment conditions.
46		08.50.009	Covered (slotted) lined drain cleaning	m	Remove all silt and debris and wash out covered lined drain to free flow conditions
47		08.50.005a	Ditch/mitre drain excavation in soft (mechanical)	m ³	Excavate mechanically for inlet, outfall, mitre and catchwater drains in soft material

No	Work Category	Code	Work Item Name	Unit	Description
48	Culvert Cleaning	08.50.005	Ditch/mitre drain excavation in soft (manual)	m ³	Excavate manually for inlet, outfall, mitre and catchwater drains in soft material
49		08.50.005b	Ditch/mitre drain excavation in hard (mechanical)	m ³	Excavate mechanically in hard material for inlet, outfall, mitre and catchwater drains.
50		08.50.005c	Ditch/mitre drain excavation in hard (manual)	m ³	Excavate manually in hard material for inlet, outfall, mitre and catchwater drains
51	Pipe Culvert Installation	08.60.021	Culvert installation-300mm with surround	m	Provide, lay and joint pipe culvert of 300mm in diameter with surround
52		08.60.020	Culvert installation-300mm without surround	m	Provide, lay and joint unhounched pipe culvert of 300mm in diameter without surround
53		08.60.023	Culvert installation-450mm with surround	m	Provide, lay and joint pipe culvert of 450mm in diameter with surround.
54		08.60.022	Culvert installation-450mm without surround	m	Provide, lay and joint pipe culvert of 450mm in diameter without surround.
55		08.60.025	Culvert installation-600mm with surround	m	Provide, lay and joint pipe culvert of 600mm in diameter with surround
56		08.60.024	Culvert installation-600mm without surround	m	Provide, lay and joint pipe culvert of 600mm in diameter without surround
57		08.60.027	Culvert installation-900mm with surround	m	Provide, lay and joint pipe culvert of 900mm in diameter with surround.
58		08.60.026	Culvert installation-900mm without surround	m	Provide, lay and joint pipe culvert of 900mm in diameter without surround
59		08.60.028	Culvert installation-1200mm with surround	m	Provide, lay and joint pipe culvert of 1200mm in diameter with surround
60		08.60.029	Culvert installation-1200mm without surround	m	Provide, lay and joint culvert of 1200mm in diameter without surround
61		08.60.030	Excavate in soft material for culverts	m ³	Excavation manually in soft material for culvert in any size.
62		08.60.031	Excavate in hard material for culverts	m ³	Excavation manually in hard material for culvert in any size.
63	Headwall Construction	08.60.019	Headwall construction for 450mm pipe culvert	No	Reconstruct or repair damaged headwall (wing-wall and apron) for 450mm pipe culvert to prevent the collapse and the potential slippage of the material and pavement above the culvert.
64		08.60.019a	Headwall construction for 600mm pipe culvert	No	Reconstruct or repair damaged headwall (wing-wall and apron) for 600mm pipe culvert to prevent the collapse and the potential slip of the material and pavement above the culvert.
65		08.60.019b	Headwall construction for 900mm pipe culvert	No	Reconstruct or repair damaged headwall (wing-wall and apron) for 900mm pipe culvert to prevent the collapse and the potential slip of the material and pavement above the culvert.
66		08.60.019c	Headwall construction for 1200mm pipe culvert	No	Reconstruct or repair damaged headwall (wing-wall and apron) for 1200mm pipe culvert to prevent the collapse and the potential slip of the material and pavement above the culvert.
67	Manhole installation	08.50.024	Manhole construction less than 1m	No	Install new small manhole of less than 1m in depth (900-1200mm in inner diameter)
68		08.50.024a	Manhole construction more than 1m	No	Install new large manhole of more than 1m in depth (900-1200mm in inner diameter)
69	Gulley Pot installation	08.50.015	Gulley pot construction	No	Provide and place gulley pots including grating (H=900mm) for inlet structures as directed by the Engineer.

No	Work Category	Code	Work Item Name	Unit	Description
70	Drain Lining	08.50.032	Lay drain lining with concrete	m ³	Place concrete lining to the slopes and invert of the ditch to prevent the scour.
71		08.50.022a	Laying of dressed stones	m ³	Place dressed stone lining to the slopes and invert of the ditch to prevent the scour.
72		08.50.022	Laying of side slabs	m ³	Place side slab lining to the slopes and invert of the ditch to prevent the scour.
73		08.70.036	Laying of 300mm invert block drain	m	Provide, lay and joint invert block drain of 300mm in diameter
74		08.70.037	Laying of 750mm invert block drain	m	Provide, lay and joint invert block drain of 750mm in width

9. Passage of Traffic

No	Work Category	Code	Work Item Name	Unit	Description
75	Traffic Control	09.50.004	Traffic Control	Day	Place warning signs, barriers and cones around the working lane on the carriageway and guide the passage of traffic through the works
76		09.50.005	Watchman	No	Provide watchman for all round surveillance.
77		09.50.006	Watering	m ³	Sprinkle water to control dust for passage of traffic through the works or compaction at earth works

10. Grading and Graveling Works

No	Work Category	Code	Work Item Name	Unit	Description
78	Grading	10.50.001	Heavy grading without watering or compaction	m ³	Trim with Motor Grader or heavy towed grader existing carriageway surface to camber, including slopes and ditches without providing watering and compaction
79		10.50.002	Heavy grading with watering and compaction	m ³	Trim with Motor Grader or heavy towed grader existing carriageway surface to camber, including slopes and ditches providing watering and compaction
80		10.50.003	Light grading	m ³	Trim with motor grader existing carriageway to camber, including slopes and ditches.
81		10.50.004	Reshaping	m ³	Restore manually the camber on earth or gravel roads by returning material from road sides and shoulder toward road centre.
82		10.50.005	Dragging	m ³	Remove manually loose material from the surface to delay the formation of corrugations
83	Graveling	10.60.001	Regraveling	m ³	Prepare for road formation and provide, place spread, shape and compact with watering gravel of not less than CBR 20%
84		10.60.001a	Regraveling without watering	m ³	Prepare for road formation and provide, place spread, shape and compact without watering gravel of not less than CBR 20%

11. Paved Roads - Shoulder Maintenance and Repairs

No	Work Category	Code	Work Item Name	Unit	Description
85	Shoulder Rebuilding	11.50.001	Shoulder grading	m ³	Prepare surface of existing shoulders, accesses and bus bays, including benching where necessary, water process and compact
86		11.50.002	Shoulder repairing	m ³	Prepare surface of existing shoulders, accesses and bus bays, water process and compact
87	Shoulder Graveling	11.50.003	Shoulder graveling with natural gravel	m ³	Provide, place, spread, shape and compact 150mm of natural gravel of CBR 30% to shoulders, accesses and bus bays
88		11.50.003a	Shoulder graveling with quarry waste	m ³	Provide, place and compact quarry waste material to shoulders, accesses and bus bays

12. Natural Material Base and Subbase

No	Work Category	Code	Work Item Name	Unit	Description
89	Pavement Removal	12.70.001	Scarify existing pavement to form subbase	m ³	Break or scarify mechanically the existing pavement layer, and compact.
90	Subbase/Base Rebuilding	12.50.001	Handpacked stone paving	m ³	Provide, lay, and compact hand packed stone material including filling of voids with stone dust
91		12.50.002	Provide, place and compact quarry waste	m ³	Provide, spread, shape and compact approved quarry waste of CBR 30% and above for 5cm in thickness.
92		12.50.003	Provide, place, spread and compact natural gravel	m ³	Provide, spread, shape and compact approved natural gravel of CBR 30% and above for 15cm in thickness.

13. Graded Crushed Stone Base and Subbase

No	Work Category	Code	Work Item Name	Unit	Description
93	Graded Crushed Stone	13.50.001	Graded Crushed Stone for subbase	m ³	Provide, place and spread approved graded crushed stone for subbase.
94		13.60.001	Graded Crushed Stone for base	m ³	Provide, place and spread approved graded crushed stone for base.

14. Cement and Lime Treated Subgrade, Subbase and Base

No	Work Category	Code	Work Item Name	Unit	Description
95	Cement/Lime Stabilization	14.50.001	Cement stabilization	m ³	Provide, spread cement on natural gravel or graded crushed stone
96		14.50.002	Lime stabilization	m ³	Provide, spread lime on natural gravel or graded crushed stone
97		14.50.003	Cement/lime mixing	m ³	Mixing in cement/lime into natural gravel or graded crushed stone
98		14.50.004	Curing and protection of treated layers	m ³	Cure and protect layers treated with cement or lime stabilizers

15. Bituminous Surface Treatment & Surface Dressing

No	Work Category	Code	Work Item Name	Unit	Description
99	Prime Coat	15.50.002	Prime Coat (MC-30 cutback bitumen)	litre	Prepare surface of carriageway, bus bays and repair areas, provide and spray MC-30 cutback bitumen at a rate of 0.8-1.2 litre/m ³ as prime coat
100	Tack Coat	15.50.003	Tack Coat (grade bitumen cutback)	litre	Prepare surface of carriageway and bus bays, provide and spray 80/100 penetration grade bitumen cut back using 5-15% kerosene as tack coat for asphalt concrete wearing course at a spray rate of 0.5-0.7 litre/m ³
101		15.50.003a	Tack Coat (bitumen emulsion)	litre	Prepare surface of repair areas provide and spray K1-60 bitumen emulsion as tack coat or seal to repair areas at a spray rate of 0.8-1.0 litre/m ³

No	Work Category	Code	Work Item Name	Unit	Description
102	Surface Dressing	15.70.001	Seal coat	litre	Cover a large worn surface area with aggregate distributed over spread bitumen to seal cracks and to recover adequate surface texture
103		15.60.002	Provide and roll 3/6 mm precoated chipping	m ³	Treat worn surface with graded aggregates of 3 to 6mm precoated with bitumen to recover adequate surface texture
104		15.60.003	Provide and roll 6/10 mm precoated chipping	m ³	Treat worn surface with graded aggregates of 6 to 10mm precoated with bitumen to recover adequate surface texture
105		15.60.004	Provide and roll 10/14 mm precoated chipping	m ³	Treat worn surface with graded aggregates of 10 to 14mm precoated with bitumen to recover adequate surface texture
106		15.60.005	Provide and roll 14/20 mm precoated chipping	m ³	Treat worn surface with graded aggregates of 14 to 20mm precoated with bitumen to recover adequate surface texture

16. Bituminous Mixes

No	Work Category	Code	Work Item Name	Unit	Description
107a	Pavement Repairing	16.50.001a	Pothole Cutting and Cleaning	m ³	Trim, cut and clean failed bituminous surface
107		16.50.001	Pothole patching - hot mix	m ³	Provide, place and compact asphaltic concrete to repair areas and for regulation to carriageway
108		16.50.002	Pothole patching - cold mix	m ³	Repair defects on bituminous surface by cold bituminous mixture
109		16.50.004	Crack sealing	m	Repair transverse or longitudinal cracking on surface dressed or asphalt concrete
110	Pavement Repairing	16.60.001	Asphalt concrete for surfacing - hot mix.	m ³	Overlay or continuously repave surface by hot bituminous mixture
111		16.70.001	Base repair - Dense Bitumen Macadam (DBM)	m ³	Place dense bitumen macadam for base material and roll
112	Milling and Paving	16.80.010	Milling the existing bituminous layer to spoil	m ³	Mill mechanically the existing bituminous layer to spoil
113		16.80.015	Milling the existing bituminous layer for reuse	m ³	Mill mechanically the existing bituminous layer and stockpile for reuse or recycle

17. Concrete Works

No	Work Category	Code	Work Item Name	Unit	Description
114	Concrete Work	17.60.001	Concrete work (class 15/20)	m ³	Provide, place and compact class 15/20 concrete mixture for blinding.
115		17.60.002	Concrete work (class 20/20)	m ³	Provide, place and compact class 20/20 concrete mixture.
116		17.60.002a	Concrete work (class 25/20)	m ³	Provide, place and compact class 25/20 concrete mixture.
117	Formwork	17.60.003	Vertical formwork class F2 finish	m ³	Provide and erect formwork of class F2 finish to the vertical direction
118		17.60.004	Horizontal formwork class F2 finish	m ³	Provide and erect formwork of class F2 finish to the horizontal direction
119	Reinforcement	17.80.004	Reinforcement work (below 16mm)	ton	Provide, cut bend and fix into position high yield reinforcement bar below 16mm
120		17.80.005	Reinforcement work (above 16mm)	ton	Provide, cut bend and fix into position high yield reinforcement bar above 16mm

20. Road Furniture Repair and Maintenance

No	Work Category	Code	Work Item Name	Unit	Description
121	Boundary posts	20.50.001	Road reserve boundary posts	No	Provide and erect road reserve boundary posts (size 1.2 x 0.2 x 0.2)
122		20.50.004	Edge marker posts	No	Provide and erect edge marker posts
123	Road Marking	20.50.007	Road markings - white paint	m ³	Provide reflectorized white paint for road markings (w = 10cm)
124		20.70.011	Road markings - white thermoplastic material	m ³	Renew faded or missing white road markings (w = 10cm) with thermoplastic material
124a		20.70.011a	Road markings on surface dressed pavement- white thermoplastic material	m ³	Renew faded or missing white road markings on surface dressed pavement (w = 10cm) with thermoplastic material
125		20.50.006	Road markings - yellow paint	m ³	Provide reflectorized yellow paint for road markings (w = 10cm)
126		20.70.010	Road markings - yellow thermoplastic material	m ³	Upgrade faded or missing yellow road markings (w = 10cm) with thermoplastic material
126a		20.70.010a	Road markings on surface dressed pavement- yellow thermoplastic material	m ³	Renew faded or missing yellow road markings on surface dressed pavement (w = 10cm) with thermoplastic material
127		20.50.107	Road marking black paint	m ³	Provide reflectorized black paint for road markings (w = 10cm)
128	Road Sign Erection	20.70.002	Warning signs	No	Provide and erect priority, prohibitory or mandatory signs
129		20.70.005	Priority, prohibitory or mandatory signs	No	Priority, prohibitory or mandatory signs
130		20.70.004	Standard informatory signs	No	Provide and erect informatory signs
131		20.70.006	Non-standard informatory signs	No	Provide and erect non-standard warning signs
132	Kerb Installation	20.50.012	Kerbs	m	Provide lay and joint concrete class 20/20 kerbs in support to carriageway, bus bays and junctions
133	Kilometre marker post Installation	20.50.013	Kilometre marker posts	No	Kilometre marker post Installation.
134	Bollard Installation	20.50.017	Concrete bollards	No	Concrete bollard Installation (diameter 0.2m, length 0.9m, embedded depth 0.45m)
135		20.50.021	Steel bollards	No	Place and provide gauge 16 steel pipe Bollards of diameter 150 mm and 1.05m above the ground embedded to a depth of 0.45m at place
136	Reflective Stud Installation	20.50.019	Reflective studs	No	Install reflective studs along the centre line
137	Microtunneling	20.60.002	Microtunneling for a 150mm diameter PVC (polyvinyl chloride) duct	m	Conduct microtunneling with a 150mm dia. PVC duct (under silt or sand condition)
138		20.60.002a	Horizontal drilling	m	Conduct horizontal drilling for 150mm hole in diameter (under gravel condition)
139	Street light Installation	20.60.017	Street lighting pole (7.6m)	No	Provide and install 7.6m street lighting pole including cables accessories and lamp.
140		20.60.018	Street lighting pole (10m)	No	Provide and install 10.0m street lighting pole including cables accessories and lamp.
141		20.60.016	Street lighting control panel	No	Provide and install 10.0m street lighting pole including cables accessories and lamp.
142		20.60.315	Electric cable	m	Provide and install supply cables between the street lighting poles.
143	Guardrail Repair	20.70.023a	Guardrail Repair Level 1	piece (4m)	Removal of damaged guardrail and replacement with straightened beam
144		20.70.023b	Guardrail Repair Level 2	piece (4m)	Removal of damaged guardrail, replacement with a straightened beam and realignment of posts
145		20.70.023c	Guardrail Repair Level 3	piece (4m)	Complete removal of damaged guardrail beam and installation with new beam, posts and spacers

Appendix 2: Price List - Labour, Machinery, Material

Appendix 2: Price List - Labour, Machinery, Material (Coast Region)

No	Item	Code	Name	Type	Unit	Unit Price 2022	Source 2022
1	Labour	22.50.001	Support Staff		Person Day	716	2022 June Market rate
		22.50.002	Unskilled labour		Person Day	716	2022 June Market rate
		22.50.005	Artisans G2		Person Day	1,417	2022 June Market rate
		22.50.007	Skilled Labour: Overseer		Person Day	1,975	2022 June Market rate
		22.50.101	Skilled Labour: Operator		Person Day	2,000	2022 June Market rate
2	Machinery	22.61.101	Truck Flat bed: 2.5 - 5 Tonnes		Hour	2,520	2022 June Market rate
		22.61.102	Truck with crane	4t	Hour	3,563	2022 June Market rate
		22.62.015	Water Tanker: 6000 - 8000 Lt.		Hour	2,745	2022 June Market rate
		22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP		Hour	6,026	2022 June Market rate
		22.63.101	Bulldozer	BD65EX	Hour	6,889	2022 June Market rate
		22.63.102	Excavator	130-150hp	Hour	6,383	2022 June Market rate
		22.63.103	Backhoe loader	130-150hp	Hour	4,417	2022 June Market rate
		22.64.001	Pedestrian Roller: 700 - 1000 Kg.		Hour	2,000	2022 June Market rate
		22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP		Hour	3,958	2022 June Market rate
		22.64.005	Pneumatic Roller: 10T, 130HP		Hour	3,488	2022 June Market rate
		22.65.008	Road Marking Machine		Hour	742	2022 June Market rate
		22.65.101	Melting pod (for paint)	200 - 350kg	Hour	2,583	2022 June Market rate
		22.67.001	Grass cutter	150cm, 35hp	Hour	153	2022 June Market rate
		22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	2022 June Market rate
		22.67.005	Vibrator P/Tamper		Hour	500	2022 June Market rate
		22.67.101	Milling machine	197hp	Hour	2,500	2022 June Market rate
		22.67.102	Resurface machine	120hp	Hour	31,985	2022 June Market rate
		22.67.103	Road heater	63hp	Hour	25,000	2022 RA rate
		22.67.104	Asphalt finisher	37H	Hour	6,500	2022 June Market rate
		22.67.105	Power suction car	4t	Hour	6,664	2022 June Market rate
		22.67.106	Muddy water processing machine		Day	51,177	2019 Feb. Market rate
		22.67.107	Boring machine	81kw	Day	53,333	2019 Feb. Market rate
		22.67.108	Air compressor	150CFM, 4250LPM	Day	8,500	2022 June Market rate
		22.67.109	Asphalt/Bitumen cutter		Hour	1,508	2022 June Market rate
		22.67.110	Chip spreader		Hour	6,167	2022 June Market rate
3	Material	22.69.009	Fine aggregates(sand)		m ³	1,794	2022 June Market price
		22.70.001	Fine aggregates (stone dust)		m ³	1,567	2022 June Market price
		22.70.002	Graded aggregates (ballast)		m ³	1,212	2022 June Market price
		22.70.003	water		m ³	247	2022 June Market price
		22.70.004	Cement (ordinary portland)		Kg	14	2022 June Market price
		22.70.006	Hydrated lime		Kg	24	2022 June Market price
		22.71.012	Square twisted bars 16mm		t	124,344	2022 June Market price
		22.72.001	Precast concrete culvert - 450mm		m	3,717	2022 June Market price

No	Item	Code	Name	Type	Unit	Unit Price 2022	Source 2022
3	Material	22.72.002	Precast concrete culvert - 600mm		m	4,075	2022 June Market price
		22.72.003	Precast concrete culvert - 900mm		m	4,875	2022 June Market price
		22.72.004	Precast concrete culvert - 1200mm		m	13,371	2022 June Market price
		22.72.016	Coarse aggregates(chippings) - 3/6mm		m ³	7,000	2022 June Market price
		22.72.017	Coarse aggregates(chippings) - 6/10mm		m ³	7,000	2022 June Market price
		22.72.018	Coarse aggregates(chippings) - 10/14mm		m ³	8,000	2022 June Market price
		22.72.019	Coarse aggregates(chippings) - 14/20mm		m ³	9,500	2022 June Market price
		22.72.020	Stone dust		m ³	1,150	2022 June Market price
		22.72.021	Gravel material (murrum)		m ³	1,164	2022 June Market price
		22.72.022	Hardcore		m ³	1,785	2022 June Market price
		22.72.023	Crusher run material (Graded crushed stone)		m ³	1,679	2022 June Market price
		22.72.024	Quarry waste material		m ³	1,686	2022 June Market price
		22.72.101	Precast concrete culvert - 300mm		m	1,600	2022 June Market price
		22.72.102	Stone		m ³	1,268	2022 June Market price
		22.72.103	Gully pot with grating		Set	18,000	Conversion Factor of Nairobi Region Market Survey
		22.72.104	Invert block drain	600*330*355	No.	658	2022 June Market price
		22.72.105	Invert block drain	600*760*190	No.	1,500	2022 June Market price
		22.72.106	Side Slab concrete block	3'*9'*24"	No.	243	2022 June Market price
		22.72.107	Manhole cover slab	1220*150	No.	5,405	2022 June Market price
		22.72.108	Soil (soft)		m ³	250	2022 June Market price
		22.72.109	Soil (hard)		m ³	400	2022 June Market price
		22.73.002	Premix - AC Type I (cold)		m ³	40,000	2022 June Market price
		22.73.003	Premix - AC Type I (hot)		m ³	22,414	2022 June Market price
		22.73.004	Dense Bitumen Macadam		m ³	22,414	2022 June Market price
		22.73.006	Bituminous sealant (K-160)		m ³	133,667	2022 June Market price
		22.73.012	MC 30 Bitumen		litre	151	2022 June Market price
		22.73.013	80/100 Pen grade bitumen		litre	133	2022 June Market price
		22.74.002	Fuel	Diesel	litre	138	2022 July. ERC Pump Price
		22.77.001	Mesh wire 8' x 4' gauge 18		m ²	600	2022 June Market price
		22.77.101	Gabion mesh	2m*1m = 2m ²	No.	5,100	2022 June Market price
		22.77.102	Gabion Mattress	10mm	m ²	3,000	2022 June Market price
		22.77.103	Flat metal plate	1/16-1/18	m ²	943	2022 June Market price
		22.77.104	Steel pipe	2inch	m	759	2022 June Market price
		22.77.105	Bolts with nuts	8cm	Set	268	Conversion Factor of Nairobi Region Market Survey
		22.77.106	Brackets		No	294	Conversion Factor of Nairobi Region Market Survey
		22.77.107	Steel angle	125*5mm	kg	274	2022 June Market price
		22.77.108	Steel plate	450*3mm	kg	105	2022 June Market price
		22.77.109	Steel bollard	SGP. 5B. 125A	kg	193	2022 June Market price
		22.77.110	Mesh wire	A142	m ²	289	2022 June Market price

No	Item	Code	Name	Type	Unit	Unit Price 2022	Source 2022
3	Material	22.77.111	Cast iron manhole cover	600*450 heavy duty with frame	No.	7,788	2022 June Market price
		22.78.101	Cypress	for fixed deck	m ³	43,427	2022 June Market price
		22.78.102	Wooden formwork panel		m ²	1,400	2022 June Market price
		22.79.003	Road marking paint yellow		litre	992	2022 June Market price
		22.79.004	Road marking paint white		litre	950	2022 June Market price
		22.79.005	Thermoplastic paint yellow	premixed with primer and glass beads	Kg	388	2022 June Market price
		22.79.006	Thermoplastic paint white	premixed with primer and glass beads	Kg	362	2022 June Market price
		22.79.012	Reflective 'cat' eyes		No	704	Conversion Factor of Nairobi Region Market Survey
		22.79.013	Reflective mark posts	White PVC post 1400	No.	3,344	Conversion Factor of Nairobi Region Market Survey
		22.79.101	Road marking paint black		litre	970	2022 June Market price
		22.79.104	Reflective paint		litre	1370	Conversion Factor of Nairobi Region Market Survey
		22.79.105	White paint		litre	833	2022 June Market price
		22.79.106	Black paint		litre	839	2022 June Market price
		22.79.107	Road Kerb	12.25*24.5	No.	488	2022 June Market price
		22.79.108	Road channel	9.8*12.25	No.	297	2022 June Market price
		22.79.109	Duct Pipe (PVC150)		m	483	2022 June Market price
		22.79.110	Equipment for lead pipe jacking	196kN	Day	35,000	2022 RA rate
		22.79.111	Equipment for lead pipe jacking (fixing part)		Day	1,300	2017 RA rate
		22.79.112	Equipment for lead pipe jacking (moving part)		m	100	2017 RA rate
		22.79.113	Equipment for Underground pipe jacking	196kN	Day	21,000	2022 RA rate
		22.79.114	Equipment for Underground pipe jacking (fixing part)		Day	9,000	2022 RA rate
		22.79.115	Equipment for Underground pipe jacking (moving part)		m	9,000	2022 RA rate
		22.79.116	Water stopper		No.	2,239	2019 Feb. Market Price
		22.79.117	Concrete anchor		No.	269	2019 Feb. Market Price
		22.79.118	Water stop cement		Kg	200	Conversion Factor of Nairobi Region Market Survey
		22.79.119	Aggregation(jacking)		kg	15	2022 RA rate
		22.79.120	Aggregation(washing)		kg	15	2022 RA rate
		22.79.121	Shank-rod	90mm	No.	300,000	2022 RA rate
		22.79.122	Driving-adapter		No.	1,500	2022 RA rate
		22.79.123	drilling-pipe		No.	50,000	2022 RA rate
		22.79.124	Ring-bit		No.	95,000	2022 RA rate
		22.79.125	Water-swivel		No.	95,000	2022 RA rate
		22.79.126	Cutter-set		No.	45,000	2022 RA rate
		22.79.127	Core-tube		No.	45,000	2022 RA rate
		22.79.128	Magnifying-bit		No.	480,000	2022 RA rate

No	Item	Code	Name	Type	Unit	Unit Price 2022	Source 2022
3	Material	22.79.129	Earth bar	10*1500mm	No.	575	2022 June Market price
		22.79.130	Lighting pole	7.6m	No.	42,213	2022 June Market price
		22.79.131	Lighting pole	10.0m	No.	80,047	2022 June Market price
		22.79.132	Cable	for light	m	503	2022 June Market price
		22.79.133	Accessories	for light	Set	3,800	2022 June Market price
		22.79.134	Lamp		No.	11,067	2022 June Market price
		22.79.135	Control panel		No.	34,500	2022 June Market price
		22.79.136	Cable	for control panel	m	1,110	2022 June Market price
		22.79.137	Accessories	for control panel	Set	34,713	2022 June Market price
		22.79.138	Meter		No.	3,982	2022 June Market price
		22.79.139	Grass		m ²	30	2022 June Market price
		22.79.140	Red soil		m ³	1,905	2022 June Market price
		22.79.141	Manure		m ³	3,095	2022 June Market price
		22.79.142	Warning triangular sign	600mm	No.	14,030	2022 June Market price
		22.79.143	Priority triangular sign	600mm	No.	14,030	2022 June Market price
		22.79.144	Standard informatory sign		No.	13,796	2022 June Market price
		22.79.145	Non-standard informatory sign	less than 1m ²	No.	27,441	2022 June Market price
		22.79.150	Guardrail Beam	4m	No.	11,388	2022 June Market price
		22.79.151	Guardrail Post	140 mm dia, 6 gauge	m	4,557	Conversion Factor of Nairobi Region Market Survey
		22.79.152	Bolts with nuts and washers (short)		No.	273	Conversion Factor of Nairobi Region Market Survey
		22.79.153	Bolts with nuts and washers (long)		No.	323	Conversion Factor of Nairobi Region Market Survey
		22.79.154	Fuel	Petrol	litre	157	2022 July. ERC Pump Price
		22.79.155	Pick up truck		day	6,438	2022 June Market Rate
		22.79.156	Truck	2 ton	day	7,333	2022 June Market Rate
		22.79.157	Thinner		litre	331	2022 June Market price
		22.79.158	Cement (OPC)		kg	13.79	2022 June Market price
		22.79.159	Pulveriser		Hour	5,000	2022 June Market Rate
		22.79.160	Hessian cloth		m ²	206	2022 June Market price
		22.79.161	K-160		litre	134	2022 June Market price
		22.79.162	Reflecting Glass Beads		kg	165	Conversion Factor of Nairobi Region Market Survey
		22.79.163	Electricity		Kw/h	24	2022 KPLC Price
		22.79.164	Beam Straightener		Hour	10,662	2019 Feb. Market Price

Appendix 3 : Unit Cost Calculation Table

Appendix 3 : Unit Cost Calculation Table (Coast Region)

No. 1

Work Category Bush Clearing
Code 04.50.001
Work Item Name Mechanical mowing

Description Cut grass by machine along the side of the road or on slopes.

Unit m2
Quantity 1,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.07	138	Based on average productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417.0	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716.0	1	716	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
22.67.001	Grass cutter	150cm, 35hp	Hour	152.5	8	1,220	Two machines half a day each 2 * 4 = 8
	Subtotal					4,908	
	Miscellaneous Cost		%		5	245	% of Subtotal
	Total					5,154	
	Per unit					5.2	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)
4. The mower is operated by artisans and fuel includes in miscellaneous cost.

No. 2

Work Category Bush Clearing
 Code 04.50.002
 Work Item Name Grass cutting (manual)

Description Cut grass manually along the side of the road or on slopes.

Unit m2
 Quantity 1,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.3	593	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0		0	
22.50.002	Unskilled labour		Person Day	716.0	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					3,457	
	Miscellaneous Cost		%		5	173	% of Subtotal
	Total					3,629	
	Per unit					3.6	Total/Quantity

Note

- 1.the quantities are based on K.R.B:Maintenance Standards Activity No.450008
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 3

Work Category Bush Clearing
 Code 04.50.003
 Work Item Name Heavy bush clearing

Description Cut, remove and dispose bushes along the side of the road, slopes or alongside ditches.

Unit m2
 Quantity 1,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	20	14,320	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					16,295	
	Miscellaneous Cost		%		5	815	% of Subtotal
	Total					17,110	
	Per unit					17.1	Total/Quantity

Note

1. The quantities are based on K.R.B: Maintenance Standards Activity No.450003
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

No. 4

Work Category Bush Clearing
 Code 04.50.004
 Work Item Name Light bush clearing

Description Cut grass by hand from shoulders, slopes, inlet ditches, and side ditches including back slopes, turnouts and culvert outlet.

Unit m2
 Quantity 1,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	10	7,160	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					9,135	
	Miscellaneous Cost		%		5	457	% of Subtotal
	Total					9,592	
	Per unit					9.6	Total/Quantity

- Note**
- 1.the quantities are based on K.R.B:Maintenance Standards Activity No.450004
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

No. 5

Work Category Bush Clearing
 Code 04.50.005
 Work Item Name Pruning of tree branches

Description Cut, remove and dispose branches of trees along the side of the road, slopes or alongside ditches.

Unit No.
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	10	7,160	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	1	716	
	Subtotal					9,851	
	Miscellaneous Cost		%		5	493	% of Subtotal
	Total					10,344	
	Per unit					103	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 6

Work Category Bush Clearing

Code 04.50.006

Work Item Name Tree cutting and stump removal (200 -450 mm)

Description Cut, remove and dispose whole trees of 200 - 450mm in girth including their stumps along the side of the road, slopes or alongside ditches.

Unit No.

Quantity 45

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	10	7,160	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					9,135	
	Miscellaneous Cost		%		5	457	% of Subtotal
	Total					9,592	
	Per unit					213	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 7

Work Category Bush Clearing
 Code 04.50.007
 Work Item Name Tree cutting and stump removal (>450 mm)

Description Cut, remove and dispose whole trees of above 450mm in girth including their stumps along the side of the road, slopes or alongside ditches.

Unit No.
 Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	10	7,160	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					9,135	
	Miscellaneous Cost		%		5	457	% of Subtotal
	Total					9,592	
	Per unit					1,918	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 8

Work Category Site Clearing and Backfill
 Code 04.50.008
 Work Item Name Clearing obstructions (mechanical)

Description Mechanically clear any obstruction including boulders and debris out of road reserve.

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.031	62	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0.5	358	Based on average productivity in Kenya
M1	Bulldozer Driving	BD65EX	Hour	11799	0.25	2,950	Based on average productivity in Kenya
	Subtotal					3,369	
	Miscellaneous Cost		%		5	168	
	Total					3,538	
	Per unit					35	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Bulldozer Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	33.84	4,660	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*180hp=33.84l
22.63.101	Bulldozer	BD65EX	Hour	6888.9	1	6,889	
	Miscellaneous Cost		%	0	0		
	Total					11,799	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 9

Work Category Site Clearing and Backfill
 Code 04.50.008a
 Work Item Name Clearing obstructions (manual)

Description Manually clear any obstruction including boulders and debris out of road reserve.

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.125	247	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	3	2,148	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					2,395	
	Miscellaneous Cost		%		5	120	% of Subtotal
	Total					2,515	
	Per unit					251	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 10

Work Category Site Clearing and Backfill
 Code 04.50.009
 Work Item Name Stripping and grubbing (mechanical)

Description Clear site on road reserve mechanically by stripping and grubbing roots.

Unit m2
 Quantity 1,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.625	1,234	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Bulldozer Driving	BD65EX	H	11,799	5	58,993	Based on average productivity in Kenya
M2	Excavator Driving	197hp	H	10,258	3.5	35,902	Based on average productivity in Kenya
	Subtotal					96,130	
	Miscellaneous Cost		%		5	4,806	
	Total					100,936	
	Per unit					101	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Bulldozer Driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	per hour 1day = 0.125day
22.74.002	Fuel	Diesel	litre	138	33.84	4,660	Based on average fuel efficiency per horsepower in Japan 0.188ℓ/hp*180hp=33.84ℓ
22.63.101	Bulldozer	BD65EX	Hour	6888.9	1	6,889	
	Miscellaneous Cost		%	0	0		
	Total					11,799	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Excavator Driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	Per hour 1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188ℓ/hp*140hp=26.32ℓ
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0		
	Total					10,258	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 11

Work Category Site Clearing and Backfill
 Code 04.50.009a
 Work Item Name Stripping and grubbing (manual)

Description Clear site on road reserve manually by stripping and grubbing roots.

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	20	14,320	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					16,295	
	Miscellaneous Cost		%		5	815	% of Subtotal
	Total					17,110	
	Per unit					171	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 12

Work Category Site Clearing and Backfill

Code 04.60.001

Work Item Name Clearing trees, hedges, bushes, vegetation and deleterious materials (mechanical)

Description

Description Clear site on road reserve mechanically by removal of trees, hedges, bushes, vegetation and other deleterious materials.

Unit m2

Quantity 1,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Bulldozer Driving	BD65EX	Hour	11,799	6	70,792	Based on average productivity in Kenya
	Subtotal					72,767	
	Miscellaneous Cost		%		5	3,638	% of Subtotal
	Total					76,405	
	Per unit					76	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Bulldozer Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	33.84	4,660	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*180hp=33.84l
22.63.101	Bulldozer	BD65EX	Hour	6888.9	1	6,889	
	Miscellaneous Cost		%	0	0		
	Total					11,799	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 13

Work Category Site Clearing and Backfill

Code 04.60.001a

Work Item Name Clearing trees, hedges, bushes, vegetation and deleterious materials (manual)

Description Clear site on road reserve manually by removal of trees, hedges, bushes, vegetation and other deleterious materials.

Unit m2

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	8	5,728	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					7,703	
	Miscellaneous Cost		%		5	385	% of Subtotal
	Total					8,088	
	Per unit					81	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 14

Work Category Concrete Demolition

Code 04.50.010

Work Item Name Excavate remove & disposal of concrete structures

Description Demolish reinforced or mass concrete structures and cart to spoil or stockpile for re-use.

Unit m3

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.625	1,234	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Excavator Driving	197hp	Hour	10,258	5	51,288	Based on average productivity in Kenya
	Subtotal					52,523	
	Miscellaneous Cost		%		5	2,626	% of Subtotal
	Total					55,149	
	Per unit					551	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0	0	
	Total					10,258	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 15

Work Category Top Soil Stripping
 Code 04.80.002
 Work Item Name Removal of overburden

Description Remove topsoil to a maximum depth of 200mm.

Unit m3
 Quantity 200

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.5	988	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Bulldozer Driving	BD65EX	Hour	11,799	4	47,195	Based on average productivity in Kenya
	Subtotal					48,182	
	Miscellaneous Cost		%		5	2,409	% of Subtotal
	Total					50,591	
	Per unit					253	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Bulldozer Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	33.84	4,660	Based on average fuel efficiency per horsepower in Japan 0.188ℓ/hp*180hp=33.84ℓ
22.63.101	Bulldozer	BD65EX	Hour	6888.9	1	6,889	
	Miscellaneous Cost		%	0	0		
	Total					11,799	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 16

Work Category Pipe Culvert Removal

Code 04.60.005

Work Item Name Removal of cracked small pipe culverts below 600mm

Description Excavate, remove and dispose cracked pipe culverts below 600mm in diameter.

Unit m

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.042	82	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Excavator Driving	197hp	Hour	10,258	0.33	3,385	Based on average productivity in Kenya
	Subtotal					3,467	
	Miscellaneous Cost		%		5	173	% of Subtotal
	Total					3,641	
	Per unit					364	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0		
	Total					10,258	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 17

Work Category Pipe Culvert Removal

Code 04.60.005a

Work Item Name Removal of cracked large pipe culverts above 600mm

Description Excavate, remove and dispose cracked pipe culverts above 600mm in diameter.

Unit m

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.042	82	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Excavator Driving	197hp	Hour	10,258	0.5	5,129	Based on average productivity in Kenya
	Subtotal					5,211	
	Miscellaneous Cost		%		5	261	% of Subtotal
	Total					5,472	
	Per unit					547	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0		
	Total					10,258	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 18

Work Category Material Filling
 Code 05.50.006
 Work Item Name Fill in soft material and compact

Description Provide, place and compact soft patching material to surface defects or gravel road. It is assumed that soil to be filled is on the site or provided from cut area.

Unit m3
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	25	17,900	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Pedestrian roller driving		Hour	2,392	10	23,918	Based on average productivity in Kenya 1.25days = 10hours
M2	Water tanker driving		Hour	5,366	2	10,732	Based on average productivity in Kenya
	Subtotal					54,525	
	Miscellaneous Cost		%		5	2,726	% of Subtotal
	Total					57,252	
	Per unit					573	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horse power in Japan 0.151l/hp*6.8hp=1.03l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horse power in Japan 0.04l/hp*334hp=13.36l
22.62.015	Water Tanker : 6000 - 8000 Lt.		Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 19

Work Category Material Filling

Code 05.50.006a

Work Item Name Fill in soft material and compact (soil purchased)

Description Provide, place and compact soft purchased patching material to surface defects or gravel road.

Unit m3

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	25	17,900	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
22.72.108	Soil (soft)		m3	250.0	120	30,000	100 * 1.2 (loss margin) = 120
M1	Pedestrian roller driving		Hour	2,392	10	23,918	Based on average productivity in Kenya 1.25days = 10hours
M2	Water tanker driving		Hour	5,366	2	10,732	Based on average productivity in Kenya
	Subtotal					84,525	
	Miscellaneous Cost		%		5	4,226	% of Subtotal
	Total					88,752	
	Per unit					888	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horse power in Japan 0.151l/hp*6.8hp=1.03l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horse power in Japan 0.04l/hp*334hp=13.36l
22.62.015	Water Tanker : 6000 - 8000 Lt.		Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 20

Work Category Material Filling
 Code 05.50.007
 Work Item Name Fill in hard material and compact

Description Provide, place and compact hard patching material to surface defects or gravel road. It is assumed that soil to be filled is on the site or provided from cut area.

Unit m3
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	25	17,900	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Pedestrian roller driving		Hour	2,392	15	35,877	Based on average productivity in Kenya 1.9days = 15hours
M2	Water tanker driving		Hour	5,366	2	10,732	Based on average productivity in Kenya
	Subtotal					66,484	
	Miscellaneous Cost		%		5	3,324	% of Subtotal
	Total					69,809	
	Per unit					698	Total/Quantity

- Note**
- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - The unit price does not include haulage cost.
 - Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horse power in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horse power in Japan 0.04ℓ/hp*334hp=13.36ℓ
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

- Note**
- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 21

Work Category Material Filling
 Code 05.50.007a
 Work Item Name Fill in hard material and compact (soil purchased)

Description Provide, place and compact hard purchased patching material to surface defects or gravel road.

Unit m3
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	25	17,900	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
22.72.109	Soil (hard)		m3	400.0	120	48,000	100 * 1.2 (loss margin) = 120
M1	Pedestrian roller driving		Hour	2,392	15	35,877	Based on average productivity in Kenya 1.9days = 15hours
M2	Water tanker driving		Hour	5,366	2	10,732	Based on average productivity in Kenya
	Subtotal					114,484	
	Miscellaneous Cost		%		5	5,724	% of Subtotal
	Total					120,209	
	Per unit					1202	Total/Quantity

- Note**
- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - The unit price does not include haulage cost.
 - Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horse power in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horse power in Japan 0.04ℓ/hp*334hp=13.36ℓ
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

- Note**
- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 22

Work Category Material Cutting
 Code 05.50.008
 Work Item Name Cut to spoil in soft

Description Cut manually soft material to spoil

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0		
	Subtotal					4,839	
	Miscellaneous Cost		%		5	242	% of Subtotal
	Total					5,081	
	Per unit					508	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)
 4. The unit price includes loading.

No. 23

Work Category Material Cutting

Code 05.50.008a

Work Item Name Cut to spoil in soft (mechanical)

Description Cut mechanically soft material to spoil

Unit m3

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Excavator driving		Hour	10,258	2	20,515	Based on average productivity in Kenya
	Subtotal					21,009	
	Miscellaneous Cost		%		5	1,050	% of Subtotal
	Total					22,060	
	Per unit					221	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0		
	Total					10,258	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 24

Work Category Material Cutting
 Code 05.50.009
 Work Item Name Cut to spoil in hard

Description Cut manually hard material to spoil

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	10	7,160	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
	Subtotal					9,135	
	Miscellaneous Cost		%		5	457	% of Subtotal
	Total					9,592	
	Per unit					959	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)
 4. The unit price includes loading.

No. 25

Work Category Material Cutting
 Code 05.50.009a
 Work Item Name Cut to spoil in hard (mechanical)

Description Cut mechanically hard material to spoil

Unit m3
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.5	988	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	0	0	
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Excavator driving		Hour	10,258	4	41,031	Based on average productivity in Kenya
	Subtotal					42,018	
	Miscellaneous Cost		%		5	2,101	% of Subtotal
	Total					44,119	
	Per unit					441	Total/Quantity

- Note**
- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - The unit price does not include haulage cost.
 - Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188ℓ/hp*140hp=26.32ℓ
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0	0	
	Total					10,258	

- Note**
- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 26

Work Category Concrete Demolition

Code 05.50.012

Work Item Name Rock fill to swamp

Description Manually provide and place rock fill to swamp

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
22.72.022	Hardcore		m3	1784.8	12	21,418	10 * 1.2 (loss margin) =12
M1	Pedestrian roller driving		Hour	2,392	1	2,392	Based on average productivity in Kenya 0.125days = 1hours
	Subtotal					30,080	
	Miscellaneous Cost		%		5	1,504	% of Subtotal
	Total					31,584	
	Per unit					3,158	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horse power in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 27

Work Category Concrete Demolition
 Code 05.50.125
 Work Item Name Rock fill to embankment construction

Description Manually provide and place rock fill to construct embankment.

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716.0	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
22.72.022	Hardcore		m3	1784.8	12	21,418	10 * 1.2 (loss margin) = 12
M1	Pedestrian roller driving		Hour	2,392	1	2,392	Based on average productivity in Kenya 0.125days = 1hours
	Subtotal					32,914	
	Miscellaneous Cost		%		5	1,646	% of Subtotal
	Total					34,560	
	Per unit					3,456	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Material quantity is based on M.o.P.W.:1988: Activity No. 30201
 3. The unit price does not include haulage cost.
 4. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horse power in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0	0	
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 28

Work Category Planting
 Code 05.50.014
 Work Item Name Grassing

Description Plant grass on the slope and inverts of ditches to reduce scour effects, or on slopes to reduce soil erosion and to improve stability.

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1.0	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	10	7,160	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
22.79.139	Grass		m2	30	100	3,000	
22.79.140	Red soil		m3	1904.8	7.5	14,286	0.075m*100m2=7.5m3
22.79.141	Manure		m3	3095	2.5	7,738	0.025m*100m2=2.5m3
	Subtotal					34,159	
	Miscellaneous Cost		%		5	1,708	% of Subtotal
	Total					35,867	
	Per unit					359	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 29

Work Category Pipe Culvert Replacement
 Code 05.60.012
 Work Item Name Compaction of subgrade in cut

Description Trim and compact.

Unit m2
 Quantity 750

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	30	21,480	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Pedestrian Roller driving	130hp	Hour	2,392	2	4,784	Based on average productivity in Kenya
	Subtotal					26,757	
	Miscellaneous Cost		%		5	1,338	% of Subtotal
	Total					28,095	
	Per unit					37	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0	0	
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 30

Work Category Pipe Culvert Replacement
 Code 05.60.014
 Work Item Name Compaction of subgrade in fill

Description Compaction of subgrade in fill.

Unit m3
 Quantity 450

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	1	0	
22.72.021	Gravel material (murrum)		m3	1163.9	540	628,506	450 *1.2(loss margin) = 540
M1	Pedestrian Roller driving	130hp	Hour	2,392	6	14,351	Based on average productivity in Kenya
	Sub Total					646,264	
	Miscellaneous Cost		%		5	32,313	% of Subtotal
	Total					678,577	
	Per unit					1,508	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian Roller driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 31

Work Category Pipe Culvert Replacement
 Code 05.60.016
 Work Item Name Compaction of original ground level

Description Compact the top 150 mm layer of existing ground below fills and cuts to 95% MDD (AASHTO T99)

Unit m2
 Quantity 3,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975.0	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417.0	0	0	
22.50.002	Unskilled labour		Person Day	716.0	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716.0	0	0	
M1	Motor Grader driving	131hp	Hour	10,195	6	61,172	Based on average productivity in Kenya
M2	Roller driving	130hp	Hour	5,439	6	32,635	Based on average productivity in Kenya
M3	Water tanker driving	10t	Hour	5,366	8	42,928	Three machines in a day 3 * 8 =24
	Subtotal					140,142	
	Miscellaneous Cost		%		5	7,007	% of Subtotal
	Total					147,149	
	Per unit					49	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader Driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716.0	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000.0	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04l/hp*334hp=13.36l
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 31a

Work Category Pipe Culvert Replacement

Code 05.60.016a

Work Item Name Compaction of the 300 mm below formation level in cutting to 100% MDD (AASHTO T99)

Description Compaction of the top 300mm below formation level in cuts and fills (subgrade) to 100% MDD

Unit m3

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	25	17,900	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	1	0	
M1	Motor Grader driving	131hp	Hour	10,195	6	61,172	Based on average productivity in Kenya
M2	Roller driving	130hp	Hour	5,439	6	32,635	Based on average productivity in Kenya
M3	Water tanker driving	10t	Hour	5,366	8.4	45,074	3000m ² *2.8L/m ² = 8400L = 8.4m ³ 1m ³ watering per hour
	Subtotal					158,756	
	Miscellaneous Cost		%		5	7,938	% of Subtotal
	Total					166,694	
	Per unit					1,667	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Motor Grader Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04l/hp*334hp=13.36l
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 32

Work Category Material Excavation for Structures
 Code 07.50.001
 Work Item Name Excavate for structure in soft material (manual)

Description Excavate manually soft material for structures.

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					4,839	
	Miscellaneous Cost		%		5	242	% of Subtotal
	Total					5,081	
	Per unit					508	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 33

Work Category Material Excavation for Structures

Code 07.50.001a

Work Item Name Excavate for structure in soft material (mechanical)

Description Excavate mechanically soft material for structures.

Unit m3

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0	0	
22.50.001	Support Staff		Person Day	716	0	0	
M1	Excavator driving		Hour	10,258	2	20,515	Based on average productivity in Kenya
	Subtotal					21,009	
	Miscellaneous Cost		%		5	1,050	% of Subtotal
	Total					22,060	
	Per unit					221	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0		
	Total					10,258	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 34

Work Category Material Excavation for Structures

Code 07.50.002

Work Item Name Excavate for structure in hard material (manual)

Description Excavate manually in hard material for structures.

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	10	7,160	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					9,135	
	Miscellaneous Cost		%		5	457	% of Subtotal
	Total					9,592	
	Per unit					959	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 35

Work Category Material Excavation for Structures

Code 07.50.002a

Work Item Name Excavate for structure in hard material (mechanical)

Description Excavate mechanically in hard material for structures.

Unit m3

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.5	988	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0	0	
22.50.001	Support Staff		Person Day	716	0	0	
M1	Excavator driving		Hour	10,258	4	41,031	Based on average productivity in Kenya
	Subtotal					42,018	
	Miscellaneous Cost		%		5	2,101	% of Subtotal
	Total					44,119	
	Per unit					441	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0	0	
	Total					10,258	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 36

Work Category Gabion
 Code 07.70.004
 Work Item Name Gabion Installation

Description Provide and place Macaferri or equivalent gabion boxes (2m * 1m * 1m).

Unit m2 (mesh area)

Quantity 110

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya standard gabion block size: 2*1*1=2m3 (mesh area 11m2 with partition in the middle) 110m2 = 10 blocs
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.77.101	Gabion mesh	2m*1m = 2m2	No.	5100	11	56,100	110m2 / 2m2 * 1.1 (loss margin) = 60.5
	Subtotal					63,773	
	Miscellaneous Cost		%		5	3,189	% of Subtotal
	Total					66,962	
	Per unit					609	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 37

Work Category Gabion
 Code 07.70.005
 Work Item Name Rock fill to Gabions

Description Provide and place rock fill to gabions.

Unit m3
 Quantity 20

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	8	5,728	Filling+Haulage within site Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.72.102	Stone		m3	1267.8	24	30,427	20 * 1.2 (loss margin) = 24
	Subtotal					40,964	
	Miscellaneous Cost		%		5	2,048	% of Subtotal
	Total					43,012	
	Per unit					2,151	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 38

Work Category Stone Pitching
 Code 07.70.001
 Work Item Name Stone pitching

Description Provide stone pitching including grouting of ratio 1:4 cement to mortar.

Unit m2
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.72.102	Stone		m3	1267.8	2.4	3,043	10 * 0.2 (thickness) * 1.2 = 2.4
B1	Mortar mixing		m3	13,225	0.6	7,935	30% of stone volume
B2	Mortar curing		m3	1,363	0.6	818	
	Subtotal					15,138	
	Miscellaneous Cost		%		5	757	% of Subtotal
	Total					15,895	
	Per unit					1,590	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.

B1 Mortar mixing

Per 1m3

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	1	716	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	-	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	1.2	2,152	1.05*1.1 (loss margin) = 1.155
	Subtotal					13,225	
	Miscellaneous Cost		%		10	1,322	% of Subtotal
	Total					13,225	

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Mortar curing

Unit m3
 Quantity 1

Per 1m3

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		10	124	% of Subtotal
	Total					1,363	
	Per unit					1,363	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 39

Work Category Ditch Cleaning
 Code 08.50.002a
 Work Item Name Ditch cleaning - mechanical

Description Mechanically desilt, shape inlets outfalls, side drains to free flow conditions

Unit m
 Quantity 1,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.15	296	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.2	859	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0		
M1	Backhoe loader driving		Hour	8,117	3	24,352	Based on average productivity in Kenya
	Subtotal					25,508	
	Miscellaneous Cost		%		5	1,020	% of Subtotal
	Total					26,528	
	Per unit					27	Total/Quantity

- Note**
1. The quantities are based on M.o.P.W.:2011: Activity No.850001
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Backhoe loader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.103	Backhoe loader	130-150hp	Hour	4243.1	1	4,243	
	Miscellaneous Cost		%	0	0		
	Total					8,117	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 40

Work Category Ditch Cleaning
 Code 08.50.002
 Work Item Name Ditch cleaning - manual

Description Manually desilt, shape inlets outfalls, side drains to free flow conditions.

Unit m
 Quantity 250

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.45	879	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	4.45	3,186	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					4,065	
	Miscellaneous Cost		%		5	203	% of Subtotal
	Total					4,268	
	Per unit					17.1	Total/Quantity

- Note**
1. The quantities are based on M.o.P.W.:2011: Activity No. 85002
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 41

Work Category Culvert Cleaning

Code 08.60.002

Work Item Name Small culvert cleaning-partially blocked-below 450mm

Description Clean culverts of below 450mm in diameter to free flow conditions

Unit m

Quantity 80

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	40	28,640	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					30,615	
	Miscellaneous Cost		%		5	1,531	% of Subtotal
	Total					32,146	
	Per unit					402	Total/Quantity

Note

1. The quantities are based on M.o.P.W.:2011: Activity No. 85002
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 42

Work Category Culvert Cleaning

Code 08.60.003

Work Item Name Medium culvert cleaning-partially blocked-600mm

Description Clean culverts of 600mm in diameter to free flow conditions

Unit m

Quantity 80

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	30	21,480	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					23,455	
	Miscellaneous Cost		%		5	1,173	% of Subtotal +tool
	Total					24,628	
	Per unit					308	Tottal/Quantity

Note

1. The quantities are based on M.o.P.W.:2011: Activity No. 85002
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 43

Work Category Culvert Cleaning

Code 08.60.004

Work Item Name Large culvert cleaning-partially blocked-900 mm and above

Description Clean culverts of 900mm and above in diameter to free flow conditions

Unit m

Quantity 80

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	20	14,320	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					16,295	
	Miscellaneous Cost		%		5	815	% of Subtotal
	Total					17,110	
	Per unit					214	Total/Quantity

Note

- 1.The quantities are based on M.o.P.W.:2011: Activity No. 85002
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 44

Work Category Culvert Cleaning
 Code 08.50.025
 Work Item Name Manhole cleaning

Description Remove all silt and debris and wash out manhole to free flow conditions.

Unit No.
 Quantity 8.3

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	5.5	3,938	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0		
	Subtotal					5,913	
	Miscellaneous Cost		%		5	296	% of Subtotal
	Total					6,209	
	Per unit					748	Total/Quantity

- Note**
1. The unit price does not include haulage cost but loading
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)
 3. 10 m3 / amount of dirt per one manhole: 1.2 m3 (1.5*0.8*1.0) = 8.3 manhole units

No. 45

Work Category Culvert Cleaning
 Code 08.50.016
 Work Item Name Gully pot cleaning

Description Clean siltation and debris from gully pot to good impoundment conditions.

Unit No.
 Quantity 67

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	10	7,160	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0		
	Subtotal					9,135	
	Miscellaneous Cost		%		5	457	% of Subtotal
	Total					9,592	
	Per unit					143	Total/Quantity

Note

1. The unit price does not include haulage cost but loading
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)
3. 10 m³ /amount of dirt per one gully pot: 0.1495 m^3 ($0.23 \times 0.23 \times \pi \times 0.90$) = 67 gully pot units

No. 46

Work Category Culvert Cleaning

Code 08.50.009

Work Item Name Covered (slotted) lined drain cleaning

Description Remove all silt and debris and wash out covered lined drain to free flow conditions

Unit m

Quantity 200

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	19.8	14,177	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					16,152	
	Miscellaneous Cost		%		5	808	% of Subtotal
	Total					16,959	
	Per unit					85	Total/Quantity

Note

1. The quantities are based on M.o.P.W.:2011: Activity No. 85002 and some are based on Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 47

Work Category Culvert Cleaning

Code 08.50.005a

Work Item Name Ditch/mitre drain excavation in soft (mechanical)

Description Excavate mechanically for inlet, outfall, mitre and catchwater drains in soft material

Unit m3

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.2	395	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0	0	
22.50.001	Support Staff		Person Day	716	0	0	
M1	Motor grader driving		Hour	10,195	2.69	27,425	Based on average estimated productivity in Japan (see note)
	Subtotal					27,820	
	Miscellaneous Cost		%		5	1,391	% of Subtotal
	Total					29,211	
	Per unit					292	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 48

Work Category Culvert Cleaning

Code 08.50.005

Work Item Name Ditch/mitre drain excavation in soft (manual)

Description Excavate manually for inlet, outfall, mitre and catchwater drains in soft material

Unit m3

Quantity 20

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0		
	Subtotal					5,555	
	Miscellaneous Cost		%		5	278	% of Subtotal
	Total					5,833	
	Per unit					292	Total/Quantity

Note

- 1.The unit price does not include haulage cost but loading
- 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 49

Work Category Culvert Cleaning

Code 08.50.005b

Work Item Name Ditch/mitre drain excavation in hard (mechanical)

Description Excavate mechanically in hard material for inlet, outfall, mitre and catchwater drains.

Unit m³

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.5	988	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.5	1,074	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Excavator driving		Hour	10,258	4	41,031	Based on average estimated productivity in Japan (see note)
	Subtotal					43,092	
	Miscellaneous Cost		%		5	2,155	% of Subtotal
	Total					45,247	
	Per unit					452	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0		
	Total					10,258	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 50

Work Category Culvert Cleaning

Code 08.50.005c

Work Item Name Ditch/mitre drain excavation in hard (manual)

Description Excavate manually in hard material for inlet, outfall, mitre and catchwater drains

Unit m3

Quantity 2

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.5	1,074	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					3,049	
	Miscellaneous Cost		%		5	152	% of Subtotal
	Total					3,201	
	Per unit					1,601	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

2. The unit price does not include haulage cost but loading

3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)

- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 51

Work Category Pipe Culvert Installation
 Code 08.60.021
 Work Item Name Culvert installation-300mm with surround

Description Provide, lay and joint pipe culvert of 300mm in diameter with surround

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	2,197	10	21,970	
B2	Base work		m2	318	6	1,908	(0.3 (diameter) + 0.05 *2 (pipe thickness) + 0.1*2 (surround thickness)) * 10 = 6.0
B3	Form work		m2	1,932	12	23,184	(0.3 + 0.05*2 + 0.1*2) * 2 (both sides) * 10 = 12.0
B4	Concrete placement Class 15/20		m3	12,293	1.7	20,898	(0.6*0.6 (surround crosssection) - 0.2*0.2*π (pipe crosssection) - ½*0.25*0.25*2 (chamfers)) * 10 = 1.718
	Total					67,960	
	Per unit					6,796	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation
 Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.75	1,063	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.101	Precast concrete culvert - 300mm		m	1600	10	16,000	
	Subtotal					19,976	
	Miscellaneous Cost		%		10	1,998	% of Subtotal
	Total					21,974	
	Per unit					2,197	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B3 Form work

Unit m2

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 15/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	10,707	10	107,070	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 52

Work Category Pipe Culvert Installation
 Code 08.60.020
 Work Item Name Culvert installation-300mm without surround

Description Provide, lay and joint unhunched pipe culvert of 300mm in diameter without surround

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	2,197	10	21,970	
B2	Base work		m2	318	6	1,908	(0.3 (diameter) + 0.05 *2 (pipe thickness) + 0.1*2 (additional width on both sides)) * 10 = 6.0
	Total					23,878	
	Per unit					2,388	Total/Quantity

- Note**
1. The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 3. The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.75	1,063	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.101	Precast concrete culvert - 300mm		m	1600	10	16,000	
	Subtotal					19,976	
	Miscellaneous Cost		%		10	1,998	% of Subtotal
	Total					21,974	
	Per unit					2,197	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murram)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 53

Work Category Pipe Culvert Installation
 Code 08.60.023
 Work Item Name Culvert installation-450mm with surround

Description Provide, lay and joint pipe culvert of 450mm in diameter with surround.

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	4,565	10	45,650	
B2	Base work		m2	318	7.5	2,385	$(0.45 \text{ (diameter)} + 0.05*2 \text{ (pipe thickness)} + 0.1*2 \text{ (surround thickness)}) * 10 = 7.5$
B3	Form work		m2	1,932	15	28,980	$(0.45 + 0.05*2 + 0.1*2) * 2 \text{ (both sides)} * 10 = 15.0$
B4	Concrete placement Class 15/20		m3	12,293	2.6	31,962	$(0.75*0.75 \text{ (surround crosssection)} - 0.275*0.275*\pi \text{ (pipe crosssection)} - \frac{1}{2} * 0.25*0.25*2 \text{ (chamfers)}) * 10 = 2.625$
	Total					108,977	
	Per unit					10,898	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation
 Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.75	1,063	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2.5	1,790	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.001	Precast concrete culvert - 450mm		m	3716.7	10	37,167	
	Subtotal					41,501	
	Miscellaneous Cost		%		10	4,150	% of Subtotal
	Total					45,651	
	Per unit					4,565	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murram)		m3	1163.9	12	13,967	$0.10*100*1.2 \text{ (loss margin)} = 12$
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B3 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 15/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	10,707	10	107,070	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 54

Work Category Pipe Culvert Installation

Code 08.60.022

Work Item Name Culvert installation-450mm without surround

Description Provide, lay and joint pipe culvert of 450mm in diameter without surround.

Unit m

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	4,565	10	45,650	
B2	Base work		m2	318	7.5	2,385	(0.45 (diameter) + 0.05 *2 (pipe thickness) + 0.1*2 (additional width on both sides)) * 10 = 7.5
	Total					48,035	
	Per unit					4,804	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation

Unit m

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.75	1,063	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2.5	1,790	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.001	Precast concrete culvert - 450mm		m	3716.7	10	37,167	
	Subtotal					41,501	
	Miscellaneous Cost		%		10	4,150	% of Subtotal
	Total					45,651	
	Per unit					4,565	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work

Unit m2

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{l}/\text{hp} \times 6.8\text{hp} = 1.03\text{l}$
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 55

Work Category Pipe Culvert Installation
 Code 08.60.025
 Work Item Name Culvert installation-600mm with surround

Description Provide, lay and joint pipe culvert of 600mm in diameter with surround

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	5,053	10	50,530	
B2	Base work		m2	318	10	3,180	(0.6 (diameter) + 0.05*2 (pipe thickness) + 0.15*2 (surround thickness)) * 10 = 10.0
B3	Form work		m2	1,932	19	36,708	(0.6 + 0.05*2 + 0.15(top surrounding) + 0.1(bottom surrounding)) * 2 (both sides) * 10 = 19.0
B4	Concrete placement Class 15/20		m3	12,293	5.0	61,465	0.5 (standard volume for surround and bed) * 10 = 5
	Total					151,883	
	Per unit					15,188	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation
 Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2.5	1,790	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.002	Precast concrete culvert - 600mm		m	4075	10	40,750	
	Subtotal					45,932	
	Miscellaneous Cost		%		10	4,593	% of Subtotal
	Total					50,525	
	Per unit					5,053	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B3 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 15/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	10,707	10	107,070	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 56

Work Category Pipe Culvert Installation
 Code 08.60.024
 Work Item Name Culvert installation-600mm without surround

Description Provide, lay and joint pipe culvert of 600mm in diameter without surround

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	5,053	10	50,530	
B2	Base work		m2	318	10	3,180	(0.6 (diameter) + 0.05 *2 (pipe thickness) + 0.15*2 (additional width on both sides)) * 10 = 10.0
	Total					53,710	
	Per unit					5,371	Total/Quantity

- Note**
1. The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 3. The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2.5	1,790	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.002	Precast concrete culvert - 600mm		m	4075	10	40,750	
	Subtotal					45,932	
	Miscellaneous Cost		%		10	4,593	% of Subtotal
	Total					50,525	
	Per unit					5,053	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{l}/\text{hp} \times 6.8\text{hp} = 1.03\text{l}$
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 57

Work Category Pipe Culvert Installation
 Code 08.60.027
 Work Item Name Culvert installation-900mm with surround

Description Provide, lay and joint pipe culvert of 900mm in diameter with surround.

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	6,124	10	61,240	
B2	Base work		m2	318	14	4,452	(0.9 (diameter) + 0.09*2 (pipe thickness) + 0.15*2 (surround thickness)) * 10 = 13.8
B3	Form work		m2	1,932	27	52,164	(0.9 + 0.09*2 + 0.15(top surrounding) + 0.1(bottom surrounding)) * 2 (both sides) * 10 = 26.6
B4	Concrete placement Class 15/20		m3	12,293	8.6	105,720	0.86 (standard volume for surround and bed) * 10 = 8.6
	Total					223,576	
	Per unit					22,358	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation
 Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1.25	1,771	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	3.75	2,685	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.003	Precast concrete culvert - 900mm		m	4875	10	48,750	
	Subtotal					55,675	
	Miscellaneous Cost		%		10	5,568	% of Subtotal
	Total					61,243	
	Per unit					6,124	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B3 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 15/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	10,707	10	107,070	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 58

Work Category Pipe Culvert Installation
 Code 08.60.026
 Work Item Name Culvert installation-900mm without surround

Description Provide, lay and joint pipe culvert of 900mm in diameter without surround

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	6,124	10	61,240	
B2	Base work		m2	318	14	4,452	(0.9 (diameter) + 0.09 *2 (pipe thickness) + 0.15*2 (additional width on both sides)) * 10 = 13.8
	Total					65,692	
	Per unit					6,569	Total/Quantity

- Note
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1.25	1,771	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	3.75	2,685	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.003	Precast concrete culvert - 900mm		m	4875	10	48,750	
	Subtotal					55,675	
	Miscellaneous Cost		%		10	5,568	% of Subtotal
	Total					61,243	
	Per unit					6,124	Total/Quantity

- Note
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murram)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 59

Work Category Pipe Culvert Installation
 Code 08.60.028
 Work Item Name Culvert installation-1200mm with surround

Description Provide, lay and joint pipe culvert of 1200mm in diameter with surround

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	15,735	10	157,350	
B2	Base work		m2	318	17	5,406	$(1.2 \text{ (diameter)} + 0.1*2 \text{ (pipe thickness)} + 0.15*2 \text{ (surround thickness)}) * 10 = 17.0$
B3	Form work		m2	1,932	33	63,756	$(1.2 + 0.1*2 + 0.15(\text{top surrounding}) + 0.1(\text{bottom surrounding})) * 2 \text{ (both sides)} * 10 = 33.0$
B4	Concrete placement Class 15/20		m3	12,293	14.6	179,478	$1.46 \text{ (standard volume for surround and bed)} * 10 = 14.6$
	Total					405,990	
	Per unit					40,599	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation
 Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.75	3,456	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1.75	2,480	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	4.75	3,401	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.004	Precast concrete culvert - 1200mm		m	13371.2	10	133,712	
	Subtotal					143,049	
	Miscellaneous Cost		%		10	14,305	% of Subtotal
	Total					157,354	
	Per unit					15,735	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	$0.10*100*1.2 \text{ (loss margin)} = 12$
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{ l/hp} \times 6.8\text{ hp} = 1.03\text{ l}$
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B3 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100×1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 15/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	10,707	10	107,070	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 60

Work Category Pipe Culvert Installation

Code 08.60.029

Work Item Name Culvert installation-1200mm without surround

Description Provide, lay and joint culvert of 1200mm in diameter without surround

Unit m

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	15,735	10	157,350	
B2	Base work		m2	318	17	5,406	(1.2 (diameter) + 0.1 *2 (pipe thickness) + 0.15*2 (additional width on both sides)) * 10 = 17.0
	Total					162,756	
	Per unit					16,276	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation

Unit m

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.75	3,456	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1.75	2,480	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	4.75	3,401	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.004	Precast concrete culvert - 1200mm		m	13371.2	10	133,712	
	Subtotal					143,049	
	Miscellaneous Cost		%		10	14,305	% of Subtotal
	Total					157,354	
	Per unit					15,735	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work

Unit m2

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murram)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{l}/\text{hp} \times 6.8\text{hp} = 1.03\text{l}$
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 61

Work Category Pipe Culvert Installation

Code 08.60.030

Work Item Name Excavate in soft material for culverts

Description Excavation manually in soft material for culvert in any size.

Unit m3

Quantity 20

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2	-	Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0		
	Subtotal					5,555	
	Miscellaneous Cost		%		5	278	% of Subtotal
	Total					5,833	
	Per unit					292	Total/Quantity

Note

1. The unit price does not include haulage cost.
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 62

Work Category Pipe Culvert Installation
 Code 08.60.031
 Work Item Name Excavate in hard material for culverts

Description Excavation manually in hard material for culvert in any size.

Unit m3
 Quantity 2

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	-	
22.50.002	Unskilled labour		Person Day	716	1.5	1,074	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	-	
	Subtotal					3,049	
	Miscellaneous Cost		%		5	152	% of Subtotal
	Total					3,201	
	Per unit					1,601	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost but loading.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 63

Work Category Headwall Construction

Code 08.60.019

Work Item Name Headwall construction for 450mm pipe culvert

Description Reconstruct or repair damaged headwall (wingwall and apron) for 450mm pipe culvert to prevent the collapse and the potential slippage of the material and pavement above the culvert.

Unit No.(a pair)

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	318	1.83	582	Refer to standard drawing
B2	Form work		m2	1,932	7.4	14,297	Refer to standard drawing
B3	ReinforCement (Mesh wire)		m2	69	4.3	293	Refer to standard drawing
B4	Concrete placement Class 25/20		m3	15,389	1.1	16,928	Refer to standard drawing
	Total (per unit)					32,100	

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.
 4. Head wall construction is assumed to include that of wingwalls and aprons. For detail, refer to the standard drawing

B1 Base work

Unit m2

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian Roller Driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	Per hour 1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B3 ReinforCement (Mesh wire)

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.77.001	Mesh wire 8' x 4' gauge 18		m2	600	110	66,000	100 * 1.1 (loss margin) = 110
	Subtotal					6,256	
	Miscellaneous Cost		%		10	626	
	Total					6,882	
	Per unit					69	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 10%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 20%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B4 Concrete placement Class 25/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	12,616	10	126,160	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					139,897	
	Miscellaneous Cost		%		10	13,990	% of Subtotal
	Total					153,887	
	Per unit					15,389	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.42	753	0.38*1.1 (loss margin) = 0.418
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.84	1,018	0.76*1.1 (loss margin) = 0.836
	Subtotal					12,616	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					12,616	
	Per unit					12,616	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 64

Work Category Headwall Construction
 Code 08.60.019a
 Work Item Name Headwall construction for 600mm pipe culvert

Description Reconstruct or repair damaged headwall (wingwall and apron) for 600mm pipe culvert to prevent the collapse and the potential slip of the material and pavement above the culvert.

Unit No.(a pair)
 Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	318	2	636	Refer to standard drawing
B2	Form work		m2	1,932	8.8	17,060	Refer to standard drawing
B3	ReinforCement (Mesh wire)		m2	69	5.1	352	Refer to standard drawing
B4	Concrete placement Class 25/20		m3	15,389	1.27	19,544	Refer to standard drawing
	Total (per unit)					37,591	

- Note**
1. The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 3. The unit cost includes gravelling for base and concrete formwork but not excavating and filling.
 4. Head wall construction is assumed to include that of wingwalls and aprons. For detail, refer to the standard drawing

B1 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian Roller Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 ReinforCement (Mesh wire)

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.77.001	Mesh wire 8' x 4' gauge 18		m2	600	100	60,000	
	Subtotal					6,256	
	Miscellaneous Cost		%		10	626	
	Total					6,882	
	Per unit					69	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 25/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	12,616	10	126,160	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					139,897	
	Miscellaneous Cost		%		10	13,990	% of Subtotal
	Total					153,887	
	Per unit					15,389	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365×1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.42	753	0.38×1.1 (loss margin) = 0.418
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.84	1,018	0.76×1.1 (loss margin) = 0.836
	Subtotal					12,616	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					12,616	
	Per unit					12,616	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 65

Work Category Headwall Construction

Code 08.60.019b

Work Item Name Headwall construction for 900mm pipe culvert

Description Reconstruct or repair damaged headwall (wingwall and apron) for 900mm pipe culvert to prevent the collapse and the potential slip of the material

Unit No.(a pair)

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	318	2.36	750	Refer to standard drawing
B2	Form work		m2	1,932	11.83	22,856	Refer to standard drawing
B3	ReinforCement (Mesh wire)		m2	69	6.6	455	Refer to standard drawing
B4	Concrete placement Class 25/20		m3	15,389	1.64	25,238	Refer to standard drawing
	Total (per unit)					49,299	

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.
 4. Head wall construction is assumed to include that of wingwalls and aprons. For detail, refer to the standard drawing

B1 Base work

Unit m2

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian Roller Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 ReinforCement (Mesh wire)

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.77.001	Mesh wire 8' x 4' gauge 18		m2	600	100	60,000	
	Subtotal					6,256	
	Miscellaneous Cost		%		10	626	
	Total					6,882	
	Per unit					69	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 25/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	12,616	10	126,160	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					139,897	
	Miscellaneous Cost		%		10	13,990	% of Subtotal
	Total					153,887	
	Per unit					15,389	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.42	753	0.38*1.1 (loss margin) = 0.418
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.84	1,018	0.76*1.1 (loss margin) = 0.836
	Subtotal					12,616	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					12,616	
	Per unit					12,616	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for

No. 66

Work Category Headwall Construction
 Code 08.60.019c
 Work Item Name Headwall construction for 1200mm pipe culvert

Description Reconstruct or repair damaged headwall (wingwall and apron) for 1200mm pipe culvert to prevent the collapse and the potential slip of the material and pavement above the culvert.

Unit No.(a pair)
 Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	318	2.72	865	Refer to standard drawing
B2	Form work		m2	1,932	17.64	34,080	Refer to standard drawing
B3	ReinforCement (Mesh wire)		m2	69	8.26	570	Refer to standard drawing
B4	Concrete placement Class 25/20		m3	15,389	2.03	31,240	Refer to standard drawing
	Total (per unit)					66,755	

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.
 4. Head wall construction is assumed to include that of wingwalls and aprons. For detail, refer to the standard drawing

B1 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian roller driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian Roller Driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 ReinforCement (Mesh wire)

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.77.001	Mesh wire 8' x 4' gauge 18		m2	600	100	60,000	
	Subtotal					6,256	
	Miscellaneous Cost		%		10	626	
	Total					6,882	
	Per unit					69	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 25/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	12,616	10	126,160	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					139,897	
	Miscellaneous Cost		%		10	13,990	% of Subtotal
	Total					153,887	
	Per unit					15,389	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.42	753	0.38*1.1 (loss margin) = 0.418
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.84	1,018	0.76*1.1 (loss margin) = 0.836
	Subtotal					12,616	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					12,616	
	Per unit					12,616	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 67

Work Category Manhole installation
 Code 08.50.024
 Work Item Name Manhole construction less than 1m

Description Install new small manhole of less than 1m in depth (900-1200mm in inner diameter)

Unit No.(a set)
 Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	242	2.2	532	bed plan: $1.6 * 1.4 = 2.24$
B2	Form work		m2	1,932	6.3	12,172	outer surrounding: $(1.6 + 1.4) * 2 * \text{outer depth:} 0.7 + \text{inner surrounding: } 1.2 * \pi * \text{inner depth:} 0.55 = 6.27$
B3	Concrete casting		m3	15,389	0.946	14,558	$1.6 * 1.4 * 0.7$ (external volume) - $1.2 * 1.2 * \pi / 4 * 0.55$ (hollow circular section) = 1.668
B6	Cover slab and cast iron cover instillation		No.	6,688	1	6,688	
	Total					33,950	
	Per unit					33,950	Total/Quantity

- Note
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.
 4. For the purpose of simplification, the depth of manhole is assumed to be 0.7m (about half of 1.35m (08.50.245)) and the inner diameter is

B1 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	$0.10 * 100 * 1.2$ (loss margin) = 12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

- Note
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Tamper driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{l}/\text{hp} * 6.8\text{hp} = 1.03\text{l}$
22.67.005	Vibrator P/Tamper		0 Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

- Note
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 Concrete placement Class 25/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
B4	Concrete mix work		m3	12,616	10	126,160	
B5	Concrete curing		m3	124	10	1,240	
	Subtotal					139,897	
	Miscellaneous Cost		%		10	13,990	% of Subtotal
	Total					153,887	
	Per unit					15,389	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete mix work

Unit m3
Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.42	753	0.38*1.1 (loss margin) = 0.418
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.84	1,018	0.76*1.1 (loss margin) = 0.836
	Subtotal					12,616	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					12,616	
	Per unit					12,616	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for

B5 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for

B6 Cover slab and cast iron cover installation

Unit No.

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.72.107	Manhole cover slab	1220*150	No.	5404.7	5	27,024	
22.77.111	Cast iron manhole cover	600*450 heavy duty with frame	No.	7788.5	0	0	
	Subtotal					31,848	
	Miscellaneous Cost		%		5	1,592	% of Subtotal
	Total					33,440	
	Per unit					6,688	Total/Quantity

Note 1. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

No. 68

Work Category Manhole installation
 Code 08.50.024a
 Work Item Name Manhole construction more than 1m

Description Install new large manhole of more than 1m in depth (900-1200mm in inner diameter)

Unit No.(a set)
 Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	242	2.2	532	bed plan: $1.6 * 1.4 = 2.24$
B2	Form work		m2	1,932	12.6	24,343	outer surrounding: $(1.6 + 1.4) * 2 * \text{outer depth}$: 1.35 + inner surrounding: $1.2 * \pi * \text{inner depth}$: 1.2 = 12.62
B3	Reinforcement (below 16mm)	6mm	t	156,103	0.0016	250	3 (no. of 6mm) * $0.9 + 4 * 0.7 = 5.5$, $5.5 * 0.294\text{kg/m} = 1.62\text{kg}$
B4	Concrete casting		m3	15,389	1.7	26,161	$1.6 * 1.4 * 1.35$ (external volume) - $1.2 * 1.2 * \pi / 4 * 1.2$ (hollow circular section) = 1.668
B7	Cover slab and cast iron cover installation		No.	6,688	1	6,688	
	Total					57,975	
	Per unit					57,975	Total/Quantity

- Note**
- 1.The quantities are based on M.o.P.W.:1988: Activity No. 30201
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.
 4. For the purpose of simplification, the depth of manhole is assumed to be 1.35m and the inner diameter is 1200mm.

B1 Base work

Unit m2
 Quantity 100

Per 100m2

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	$0.10 * 100 * 1.2$ (loss margin) = 12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Tamper driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{l}/\text{hp} * 6.8\text{hp} = 1.03\text{l}$
22.67.005	Vibrator P/Tamper	0	Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 Reinforcement (below 16mm)

Unit ton
Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.25	3,188	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.71.012	Square twisted bars 16mm		t	124344.2	1.1	136,779	1.0 * 1.1 (loss margin) =1.1
	price adjustment		%		3	(4,103)	deduction to above 16mm price
	Subtotal					141,912	
	Miscellaneous Cost		%		10	14,191	
	Total					156,103	
	Per unit					156,103	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete placement Class 25/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	12,616	10	126,160	
B6	Concrete curing		m3	124	10	1,240	
	Subtotal					139,897	
	Miscellaneous Cost		%		10	13,990	% of Subtotal
	Total					153,887	
	Per unit					15,389	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.42	753	0.38*1.1 (loss margin) = 0.418
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.84	1,018	0.76*1.1 (loss margin) = 0.836
	Subtotal					12,616	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					12,616	
	Per unit					12,616	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B7 Cover slab and cast iron cover installation

Unit No.

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.72.107	Manhole cover slab	1220*150	No.	5404.7	5	27,024	
22.77.111	Cast iron manhole cover	600*450 heavy duty with frame	No.	7788.5	0	0	
	Subtotal					31,848	
	Miscellaneous Cost		%		5	1,592	% of Subtotal
	Total					33,440	
	Per unit					6,688	Total/Quantity

Note 1. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

No. 69

Work Category Gulley Pot installation
 Code 08.50.015
 Work Item Name Gulley pot construction

Description Provide and place gulley pots including grating (H=900mm) for inlet structures as directed by the Engineer.

Unit No.(a set)
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		Set	10,489	10	104,890	
B2	Base work		m2	242	4.9	1,186	0.7*0.7*10=4.9
	Total					106,076	
	Per unit					10,608	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation
 Unit Set
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.5	988	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.72.103	Gully pot with grating		Set	18000	10	91,520	
	Subtotal					95,357	
	Miscellaneous Cost		%		10	9,536	% of Subtotal
	Total					104,892	
	Per unit					10,489	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B1 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murram)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Tamper driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.005	Vibrator P/Tamper	0	Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 70

Work Category Drain Lining
 Code 08.50.032
 Work Item Name Lay drain lining with concrete

Description Place concrete lining to the slopes and invert of the ditch to prevent the scour.

Unit m2 (t=10cm)
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	324	100	32,400	
B2	Reinforcement (Mesh wire)	A142	m2	69	100	6,900	
B3	Concrete casting		m3	15,389	10	153,890	0.1 * 100 = 10.0
	Total					193,190	
	Per unit					1,932	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian Roller Driving		Hour	2,502	4.81	12,034	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,825	
	Miscellaneous Cost		%		5	1,541	% of Subtotal
	Total					32,366	
	Per unit					324	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian Roller Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.18	360	1hour = 0.18day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,502	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 ReinforCement (Mesh wire)

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.77.110	Mesh wire	A142	m2	288.6	100	28,860	
	Subtotal					6,256	
	Miscellaneous Cost		%		10	626	
	Total					6,882	
	Per unit					69	Total/Quantity

- Note**
1. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B3 Concrete placement Class 25/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
B4	Concrete mix work		m3	12,616	10	126,160	
B5	Concrete curing		m3	124	10	1,240	
	Subtotal					139,897	
	Miscellaneous Cost		%		10	13,990	% of Subtotal
	Total					153,887	
	Per unit					15,389	Total/Quantity

- Note**
1. The unit price does not include haulage cost.
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 10%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 20%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B4 Concrete mix work

Unit m3
Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.42	753	0.38*1.1 (loss margin) = 0.418
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.84	1,018	0.76*1.1 (loss margin) = 0.836
	Subtotal					12,616	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					12,616	
	Per unit					12,616	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B5 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 71

Work Category Drain Lining
 Code 08.50.022a
 Work Item Name Laying of dressed stones

Description Place dressed stone lining to the slopes and invert of the ditch to prevent the scour.

Unit m2
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	318	10	3,180	$(1.20+0.05*2+0.1*2)*10=15.0$
B2	Stone dressing		m3	1,502	10	15,020	$(1.5*1.5-0.65*0.65*\pi)*10=9.23$
B3	Mortar mixing		m3	13225	0.05	661	
B4	Mortar curing		m3	1363	0.05	68	
	Total					18,929	
	Per unit					1,893	Total/Quantity

- Note**
- 1.The quantities are based on M.o.P.W.:1988: Activity No. 30201
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian Roller Driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	$0.10*100*1.2$ (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 10%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 20%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian Roller Driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{t}/\text{hp}^6.8\text{hp}=1.03\text{t}$
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Stone dressing

Unit m2

Quantity 6

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3	2,148	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	-	
22.72.102	Stone		m3	1267.8	2.4	3,043	10 * 0.2 (thickness) *1.2 (loss margin) = 2.4
	Subtotal					8,583	
	Miscellaneous Cost		%		5	429	% of Subtotal
	Total					9,012	
	Per unit					1,502	Total/Quantity

Note

- 1.The unit price does not include haulage cost.
- 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B3 Mortar mixing

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	1	716	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	-	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	1.2	2,152	1.05*1.1 (loss margin) = 1.155
	Subtotal					13,225	
	Miscellaneous Cost		%		10	1,322	% of Subtotal
	Total					13,225	

Note

- 1.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B4 Mortar curing

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		10	124	% of Subtotal
	Total					1,363	
	Per unit					1,363	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 72

Work Category Drain Lining
 Code 08.50.022
 Work Item Name Laying of side slabs

Description Place side slab lining to the slopes and invert of the ditch to prevent the scour.

Unit m2 (t = 10cm)
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	318	100	31,800	
B2	Installation		m2	2,582	100	258,200	0.1*100=10.0
	Total					290,000	
	Per unit					2,900	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian Roller Driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian Roller Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.		Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Installation

Unit m2
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	-	
22.72.106	Side Slab concrete block	3''*9''*24"	No.	242.7	78.6	19,076	$0.23m(9'') * 0.61m(24'') = 0.14 \text{ m}^2/\text{No.}$ $(10m^2/0.14) * 1.1 \text{ (loss margin)} = 78.57$
B3	Mortar mixing		m3	12590	0.05	630	
B4	Mortar curing		m3	1239	0.05	62	
	Subtotal					24,592	
	Miscellaneous Cost		%		5	1,230	% of Subtotal
	Total					25,821	
	Per unit					2,582	Total/Quantity

- Note**
- 1.The unit price does not include haulage cost.
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B3 Mortar mixing

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	1	716	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	-	
22.70.004	Cement (ordinary portland)		Kg	13.8	369	5,092	$365 * 1.01 \text{ (loss margin)} = 369$
22.69.009	Fine aggregates(sand)		m3	1793.6	1.1	1,973	$1.05 * 1.05 \text{ (loss margin)} = 1.1$
	Subtotal					12,590	
	Miscellaneous Cost		%		0	-	% of Subtotal
	Total					12,590	

B4 Mortar curing

Unit m3
Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					1,239	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 73

Work Category Drain Lining
 Code 08.70.036
 Work Item Name Laying of 300mm invert block drain

Description Provide, lay and joint invert block drain of 300mm in diameter

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	1,594	10	15,940	
B2	Base work		m2	318	6.5	2,067	(0.3 (IBD diameter) + 0.075 (block side thickness) * 2 + 0.1(surround) * 2) * 10 = 6.5
	Total					18,007	
	Per unit					1,801	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation

Unit m
 Quantity 20

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.104	Invert block drain	600*330*355	No.	658.4	36.7	24,163	(20m/0.6m) per No. * 1.1 (loss margin) = 36.7
	Subtotal					28,987	
	Miscellaneous Cost		%		10	2,899	% of Subtotal
	Total					31,886	
	Per 1m					1,594	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian Roller Driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Pedestrian Roller Driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{t}/\text{hp} \times 6.8\text{hp} = 1.03\text{t}$
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 74

Work Category Drain Lining
 Code 08.70.037
 Work Item Name Laying of 750mm invert block drain

Description Provide, lay and joint invert block drain of 750mm in width

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		m	3,372	10	33,720	
B2	Base work		m2	318	9.5	3,021	(0.6 (IBD width) + 0.075 (block side thickness) * 2 + 0.1(surround) * 2) * 10 = 9.5
	Total					36,741	
	Per unit					3,674	Total/Quantity

- Note**
- 1.The quantities are based on standard drawings
 2. The unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Installation

Unit m
 Quantity 20

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.72.105	Invert block drain	600*760*190	No.	1500	36.7	55,050	(20m/0.6m) per No. * 1.1 (loss margin) = 36.7
	Subtotal					61,306	
	Miscellaneous Cost		%		10	6,131	% of Subtotal
	Total					67,437	
	Per 1m					3,372	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Pedestrian Roller Driving		Hour	2,392	4.81	11,505	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	0.10*100*1.2 (loss margin) = 12
	Subtotal					30,296	
	Miscellaneous Cost		%		5	1,515	% of Subtotal
	Total					31,810	
	Per unit					318	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Pedestrian Roller Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{ l/hp} \times 6.8\text{ hp} = 1.03\text{ l}$
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0		
	Total					2,392	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 75

Work Category Traffic Control

Code 09.50.004

Work Item Name Traffic Control

Description Place warning signs, barriers and cones around the working lane on the carriageway and guide the passage of traffic through the works

Unit Day

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.13	257	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.05	71	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,760	
	Miscellaneous Cost		%		5	88	% of Subtotal
	Total					1,848	
	Per unit					1,848	Total/Quantity

Note

1. The quantities are based on site survey conducted in 2011
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 76

Work Category Traffic Control

Code 09.50.005

Work Item Name Watchman

Description Provide watchman for all round surveillance.

Unit No. (a set per day)

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.13	257	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0	0	
22.50.001	Support Staff		Person Day	716	2	1,432	2 shifts per day
	Subtotal					1,689	
	Miscellaneous Cost		%		5	84	% of Subtotal
	Total					1,773	
	Per unit					1,773	Total/Quantity

Note

1. The quantities are based on site survey conducted in 2011
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 77

Work Category Traffic Control
 Code 09.50.006
 Work Item Name Watering

Description Sprinkle water to control dust for passage of traffic through the works or compaction at earth works

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
M1	water tanker driving		Hour	5,366	0.28	1,502	1.4litre/m2*2 times = 2.8litre/m2 280litre(0.28m3) per 100m2
	Total					1502	
	Per unit					15	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.

M1 water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04l/hp*334hp=13.36l
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 78

Work Category Grading
 Code 10.50.001
 Work Item Name Heavy grading without watering or compaction

Description Trim with Motor Grader or heavy towed grader existing carriageway surface to camber, including slopes and ditches without providing watering and compaction

Unit m2
 Quantity 10,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.5	988	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	-	
22.50.002	Unskilled labour		Person Day	716	1.5	1,074	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	-	
M1	Motor Grader driving	131hp	Hour	10,195	5.5	56,074	Based on average productivity in Kenya
	Subtotal					58,136	
	Miscellaneous Cost		%		5	2,907	% of Subtotal
	Total					61,042	
	Per unit					6.1	Total/Quantity

- Note**
1. The quantities are based on M.o.P.W.:2011: Activity No. 1050001
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 79

Work Category Grading
Code 10.50.002
Work Item Name Heavy grading with watering and compaction

Description Trim with Motor Grader or heavy towed grader existing carriageway surface to camber, including slopes and ditches providing watering and compaction

Unit m2
Quantity 10,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.5	988	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	-	
22.50.002	Unskilled labour		Person Day	716	1.5	1,074	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	1	716	Based on average productivity in Kenya
M1	Motor Grader driving	131hp	Hour	10,195	5.5	56,074	Based on average productivity in Kenya
M2	Roller driving	130hp	Hour	5,439	4	21,757	Based on average productivity in Kenya
M3	Water tanker driving	10t	Hour	5,366	4	21,464	
	Subtotal					102,072	
	Miscellaneous Cost		%		5	5,104	% of Subtotal
	Total					107175.9	
	Per unit					10.7	Total/Quantity

- Note**
1. The quantities are based on M.o.P.W.:2011: Activity No. 1050001
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Per hour Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Per hour Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 water tanker driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04l/hp*334hp=13.36l
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 80

Work Category Grading
 Code 10.50.003
 Work Item Name Light grading

Description Trim with motor grader existing carriageway to camber, including slopes and ditches.

Unit m2
 Quantity 18,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	-	
22.50.002	Unskilled labour		Person Day	716	1	716	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	1	716	Based on average productivity in Kenya
M1	Motor Grader driving	131hp	Hour	10,195	8	81,562	Based on average productivity in Kenya
	Subtotal					84,969	
	Miscellaneous Cost		%		5	4,248	% of Subtotal
	Total					89,218	
	Per unit					5	Total/Quantity

- Note**
1. The quantities are based on M.o.P.W.:2011: Activity No. 1050004
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 81

Work Category Grading
 Code 10.50.004
 Work Item Name Reshaping

Description Restore manually the camber on earth or gravel roads by returning material from road sides and shoulder toward road centre.

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.15	296.25	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.5	1074	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716			
	Subtotal					1370.3	
	Miscellaneous Cost		%		5	69	% of Subtotal
	Total					1438.8	
	Per unit					14.4	Total/Quantity

- Note**
- 1.The quantities are based on field survey 2011
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 82

Work Category Grading
 Code 10.50.005
 Work Item Name Dragging

Description Remove manually loose material from the surface to delay the formation of corrugations

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.15	296.25	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.5	1074	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1370.3	
	Miscellaneous Cost		%		5	69	% of Subtotal
	Total					1438.8	
	Per unit					14.4	Total/Quantity

- Note**
1. The quantities are based on field survey 2011
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 83

Work Category Gravelling
 Code 10.60.001
 Work Item Name Regravelling

Description Prepare for road formation and provide, place spread, shape and compact with watering gravel of not less than CBR 20%

Unit m3
 Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.02	30	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1,417	0.00	-	
22.50.002	Unskilled labour		Person Day	716	0.04	27	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0.00	-	
22.72.021	Gravel material (murrum)		m3	1,164	6.00	6,983	5*1.2 (loss margin) = 6
M1	Motor Grader driving	131hp	Hour	9,981	0.07	698	Based on average productivity in Kenya
M2	Roller driving	130hp	Hour	5,439	0.03	186	Based on average productivity in Kenya
M3	water tanker driving	10t	Hour	4,421	0.02	86	Based on average productivity in Kenya
	Subtotal					8,011	
	Miscellaneous Cost		%		5	401	% of Subtotal
	Total					8,412	
	Per unit					1,682	Total/Quantity

- Note**
- 1.The quantities are based on field survey 2011
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 4. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.143	286	1 day =7 hours 0.143day
22.50.002	Unskilled labour		Person Day	716	0.13	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	138	26.00	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6,026	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					9,981	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3,686	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	6.50	894	Based on average productivity in Kenya
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3,030	1	3,030	
22.70.003	water		m3	247	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					4,421	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 84

Work Category Gravelling
 Code 10.60.001a
 Work Item Name Regravelling without watering

Description Prepare for road formation and provide, place spread, shape and compact without watering gravel of not less than CBR 20%

Unit m3
 Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.02	30	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.00	-	
22.50.002	Unskilled labour		Person Day	716	0.04	27	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0.00	-	
22.72.021	Gravel material (murrum)		m3	1163.9	6.00	6,983	5*1.2 (loss margin) = 6
M1	Motor Grader driving	131hp	Hour	9,945	0.07	696	Based on average productivity in Kenya
M2	Roller driving	130hp	Hour	5,439	0.03	186	Based on average productivity in Kenya
	Subtotal					7,923	
	Miscellaneous Cost		%		5	396	% of Subtotal
	Total					8,319	
	Per unit					1,664	Total/Quantity

- Note**
- 1.The quantities are based on field survey 2011
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)
 4. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio (2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.13	250	1 day = 8 hours 0.125day
22.50.002	Unskilled labour		Person Day	716	0.13	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26.00	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					9,945	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 85

Work Category Shoulder Rebuilding

Code 11.50.001

Work Item Name Shoulder grading

Description Prepare surface of existing shoulders, accesses and bus bays, including benching where necessary, water process and compact

Unit m2

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0.35	251	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Motor Grader driving	131hp	Hour	10,195	0.09	918	Based on average estimated productivity in Japan (see note)
M2	Roller driving	120hp	Hour	5,439	0.09	490	Based on average estimated productivity in Japan (see note)
M3	Water tanker driving	10t	Hour	5,366	0.28	1,502	100m ² *2.8L/m ² = 280L = 0.28m ³ 1m ³ watering per hour
	Subtotal					3,160	
	Miscellaneous Cost		%		5	158	% of Subtotal
	Total					3,318	
	Per unit					33	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04ℓ/hp*334hp=13.36ℓ
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 86

Work Category Shoulder Rebuilding
 Code 11.50.002
 Work Item Name Shoulder repairing

Description Prepare surface of existing shoulders, accesses and bus bays, water process and compact

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0.35	251	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Motor Grader driving	131hp	Hour	10,195	0.09	918	Based on average estimated productivity in Japan (see note)
M2	Roller driving	130hp	Hour	5,439	0.09	490	Based on average estimated productivity in Japan (see note)
M3	Water tanker driving	10t	Hour	5,366	0.28	1,502	100m ² *2.8L/m ² = 280L = 0.28m ³ 1m ³ watering per hour
	Subtotal					3,160	
	Miscellaneous Cost		%		5	158	% of Subtotal
	Total					3,318	
	Per unit					33	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

Per hour

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

Per hour

Note	1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.
-------------	--

No. 87

Work Category Shoulder Graveling
 Code 11.50.003
 Work Item Name Shoulder graveling with natural gravel

Description Provide, place, spread, shape and compact 150mm of natural gravel of CBR 30% to shoulders, accesses and bus bays

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.08	158	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0.35	251	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	10*1.2 (loss margin) = 12
M1	Motor Grader driving	131hp	Hour	10,195	0.09	918	Based on average estimated productivity in Japan (see note)
M2	Roller driving	130hp	Hour	5,439	0.09	490	Based on average estimated productivity in Japan (see note)
M3	Water tanker driving	10t	Hour	5,366	0.09	483	Based on average estimated productivity in Japan (see note)
	Subtotal					16,265	
	Miscellaneous Cost		%		5	813	% of Subtotal
	Total					17,079	
	Per unit					1,708	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M4 water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04ℓ/hp*334hp=13.36ℓ
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 88

Work Category Shoulder Gravelling
 Code 11.50.003a
 Work Item Name Shoulder gravelling with quarry waste

Description Provide, place and compact quarry waste material to shoulders, accesses and bus bays

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.08	158	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0.35	251	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.024	Quarry waste material		m3	1686.2	12.7	21,415	10*1.2 (loss margin) = 12
M1	Motor Grader driving	131hp	Hour	10,195	0.09	918	Based on average estimated productivity in Japan (see note)
M2	Roller driving	130hp	Hour	5,439	0.09	490	Based on average estimated productivity in Japan (see note)
M3	Water tanker driving	10t	Hour	5,366	0.09	483	Based on average estimated productivity in Japan (see note)
	Subtotal					23,713	
	Miscellaneous Cost		%		5	1,186	% of Subtotal
	Total					24,899	
	Per unit					2,490	Total/Quantity

Note

- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
- The unit price does not include haulage cost.
- Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0 Hour		3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M4 water tanker driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04l/hp*334hp=13.36l
22.62.015	Water Tanker : 6000 - 8000 Lt.	0 Hour		3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 89

Work Category Pavement Removal
Code 12.70.001
Work Item Name Scarify existing pavement to form subbase

Description Break or scarify mechanically the existing pavement layer, and compact.

Unit m3
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	3.4	6,715	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	3.4	2,434	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Excavator driving	197hp	Hour	10,368	7.2	74,647	Based on average estimated productivity in Japan (see note)
M2	Motor Grader driving	131hp	Hour	10,195	0.09	918	Based on average estimated productivity in Japan (see note)
M3	Roller driving	130hp	Hour	5,439	0.09	490	Based on average estimated productivity in Japan (see note)
M4	Water tanker driving	10t	Hour	5,366	0.625	3,354	Based on average estimated productivity in Kenya
	Subtotal					88,557	
	Miscellaneous Cost		%		5	4,428	% of Subtotal
	Total					92,985	
	Per unit					930	Total/Quantity

- Note**
- The quantities are based on site survey conducted in 2011
 - The unit price does not include haulage cost.
 - Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)
 - Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M1 Excavator Driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.18	360	1 hour = 0.18day
22.74.002	Fuel	Diesel	litre	137.7	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0		
	Total					10,368	

- Note**
- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Motor Grader driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP		0 Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M4 water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04ℓ/hp*334hp=13.36ℓ
22.62.015	Water Tanker : 6000 - 8000 Lt.		0 Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 90

Work Category Subbase/Base Rebuilding
 Code 12.50.001
 Work Item Name Handpacked stone paving

Description Provide, lay, and compact hand packed stone material including filling of voids with stone dust

Unit m3 (t = 15cm)
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	7.4	10,486	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	3.7	2,649	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.022	Hardcore		m3	1784.8	12	21,418	10*1.2 (loss margin) = 12
22.72.020	Stone dust		m3	1149.8	1.5	1,725	Based on average unit quantity in Kenya
M1	Roller driving		Hour	5,439	2	10,878	Based on average productivity in Kenya
	Subtotal					49,131	
	Miscellaneous Cost		%		5	2,457	% of Subtotal
	Total					51,587	
	Per unit					5,159	Total/Quantity

- Note**
1. The quantities are based on site survey conducted in 2011
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 91

Work Category Subbase/Base Rebuilding
 Code 12.50.002
 Work Item Name Provide, place and compact quarry waste

Description Provide, spread, shape and compact approved quarry waste of CBR 30% and above for 5cm in thickness.

Unit m3 (t = 5cm)
 Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.08	158	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1.4	1,984	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	4.43	3,172	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.024	Quarry waste material		m3	1686.2	6	10,117	5*1.2 (loss margin) = 6
M1	Roller driving		Hour	2,392	6.26	14,973	Based on average estimated productivity in Japan (see note)
	Subtotal					30,404	
	Miscellaneous Cost		%		5	1,520	% of Subtotal
	Total					31,924	
	Per unit					6,385	Total/Quantity

- Note**
- 1.The quantities are based on site survey conducted in 2011
 - 2.Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 - 3.The unit price does not include haulage cost.
 - 4.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.001	Pedestrian Roller : 700 - 1000 Kg.	0	Hour	2000	1	2,000	
	Miscellaneous Cost		%	0	0	0	
	Total					2,392	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 92

Work Category Subbase/Base Rebuilding

Code 12.50.003

Work Item Name Provide, place, spread and compact natural gravel

Description Provide, spread, shape and compact approved natural gravel of CBR 30% and above for 15cm in thickness.

Unit m3 (t = 15cm)

Quantity 15

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.125	247	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1,417	0	0	
22.50.002	Unskilled labour		Person Day	716	0.6	430	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.021	Gravel material (murrum)		m3	1,164	18	20,950	15*1.2 (loss margin) = 18
M1	Motor Grader driving	131hp	Hour	10,195	0.13	1,325	Based on average estimated productivity in Japan (see note)
M2	Roller driving	130hp	Hour	5,439	0.13	707	Based on average estimated productivity in Japan (see note)
M3	water tanker driving	10t	Hour	5,366	0.13	698	Based on average estimated productivity in Japan (see note)
	Subtotal					24,357	
	Miscellaneous Cost		%		5	1,218	% of Subtotal
	Total					25,575	
	Per unit					1,705	Total/Quantity

Note

1. Material quantity is based on M.o.P.W.:1988: Activity No. 30201
2. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
3. The unit price does not include haulage cost.
4. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	138	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6,026	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3,686	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 water tanker driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04ℓ/hp*334hp=13.36ℓ
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3,030	1	3,030	
22.70.003	water		m3	247	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 93

Work Category Graded Crushed Stone
 Code 13.50.001
 Work Item Name Graded Crushed Stone for subbase

Description Provide, place and spread approved graded crushed stone for subbase.

Unit m3 (t = 15cm)
 Quantity 15

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.125	247	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1,417	0	0	
22.50.002	Unskilled labour		Person Day	716	0.6	430	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.023	Crusher run material (Graded crushed stone)		m3	1,679	18	30,222	15*1.2 (loss margin) = 18
M1	Motor Grader driving	131hp	Hour	10,195	0.13	1,325	Based on average estimated productivity in Japan (see note)
M2	Roller driving	130hp	Hour	5,439	0.13	707	Based on average estimated productivity in Japan (see note)
M3	water tanker driving	10t	Hour	5,366	0.13	698	Based on average estimated productivity in Japan (see note)
	Subtotal					33,629	
	Miscellaneous Cost		%		5	1,681	% of Subtotal
	Total					35,310	
	Per unit					2,354	Total/Quantity

- Note**
1. Material quantity is based on M.o.P.W.:1988: Activity No. 30201
 2. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 3. The unit price does not include haulage cost.
 4. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Motor Grader driving							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	138	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6,026	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	Per hour 1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084t/hp*130hp=10.92t
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3,686	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 water tanker driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	Per hour 1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.04t/hp*334hp=13.36t
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3,030	1	3,030	
22.70.003	water		m3	247	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 94

Work Category Graded Crushed Stone
 Code 13.60.001
 Work Item Name Graded Crushed Stone for base

Description Provide, place and spread approved graded crushed stone for base.

Unit m3(t = 15cm)
 Quantity 15

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.125	247	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0.6	430	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.023	Crusher run material (Graded crushed stone)		m3	1679	18	30,222	15*1.2 (loss margin) = 18
M1	Motor Grader driving	131hp	Hour	10,195	0.13	1,325	Based on average estimated productivity in Japan (see note)
M2	Roller driving	130hp	Hour	5,439	0.13	707	Based on average estimated productivity in Japan (see note)
M3	water tanker driving	10t	Hour	5,366	0.13	698	Based on average estimated productivity in Japan (see note)
	Subtotal					33,629	
	Miscellaneous Cost		%		5	1,681	% of Subtotal
	Total					35,310	
	Per unit					2,354	Total/Quantity

- Note**
1. Material quantity is based on M.o.P.W.:1988: Activity No. 30201
 2. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for
 3. The unit price does not include haulage cost.
 4. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Motor Grader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.25	500	1 day = 8 hours 0.125day (= 1hour) * 2 (operator + mechanic) = 0.25
22.50.002	Unskilled labour		Person Day	716	0.125	90	0.125day (= 1hour) * 1 (turnboy) = 0.125
22.74.002	Fuel	Diesel	litre	137.7	26	3,580	Based on average productivity in Kenya
22.63.012	Motor Grader (e.g. CAT 112F): 100 - 130 HP	0	Hour	6025.6	1	6,026	
	Miscellaneous Cost		%	0	0		
	Total					10,195	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3685.5	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 water tanker driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	13.36	1,840	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.62.015	Water Tanker : 6000 - 8000 Lt.	0	Hour	3029.6	1	3,030	
22.70.003	water		m3	246.7	1	247	Temporarily estimated quantity
	Miscellaneous Cost		%	0	0		
	Total					5,366	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 95

Work Category Cement/Lime Stabilization

Code 14.50.001

Work Item Name Cement stabilization

Description Provide, spread cement on natural gravel or graded crushed stone

Unit m3

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.125	247	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1.4	1,984	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	4.43	3,172	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.158	Cement (OPC)		kg	13.8	550	7,590	Assumed quantity for average soil condition: 500 * 1.1 (loss margin) = 550
	Subtotal					12,993	
	Miscellaneous Cost		%		5	650	% of Subtotal
	Total					13,642	
	Per unit					2,728	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 96

Work Category Cement/Lime Stabilization

Code 14.50.002

Work Item Name Lime stabilization

Description Provide, spread lime on natural gravel or graded crushed stone

Unit m3

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.125	247	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1.4	1,984	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	4.43	3,172	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.006	Hydrated lime		Kg	24.2	550	13,310	Assumed quantity for average soil condition: 500 * 1.1 (loss margin) = 550
	Subtotal					18,713	
	Miscellaneous Cost		%		5	936	% of Subtotal
	Total					19,648	
	Per unit					3,930	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 97

Work Category Cement/Lime Stabilization

Code 14.50.003

Work Item Name Cement/lime mixing

Description Mixing in cement/lime into natural gravel or graded crushed stone

Unit m3

Quantity 840

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	0	0	Based on average productivity in Kenya
B1	Pulveriser		hour	8,289	8	66,312	
	Total					68,287	
	Per unit					81	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.

M1 Pulveriser driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	11.18	1,539	Based on average fuel efficiency per horsepower in Japan 0.086l/hp*130hp=11.18l
22.79.159	Pulveriser		Hour	6,500	1	6,500	
	Miscellaneous Cost		%	0	0		
	Total					8,289	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 98

Work Category Cement/Lime Stabilization
 Code 14.50.004
 Work Item Name Curing and protection of treated layers

Description Cure and protect layers treated with cement or lime stabilizers

Unit m2
 Quantity 200

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.125	247	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	2.13	1,525	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.003	water		m3	246.7	1	247	
22.79.160	Hessian cloth		m2	205.6	50	10,280	
	Subtotal					12,299	
	Miscellaneous Cost		%		5	615	% of Subtotal
	Total					12,914	
	Per unit					64.6	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 99

Work Category Prime Coat
 Code 15.50.002
 Work Item Name Prime Coat (MC-30 cutback bitumen)

Description Prepare surface of carriageway, bus bays and repair areas, provide and spray MC-30 cutback bitumen at a rate of 0.8-1.2 litre/m² as prime coat

Unit litre
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.04	79	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.12	170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.13	93	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716			
M1	Sprayer driving		Hour	959	2.97	2,848	Based on average estimated productivity in Japan (see note)
22.73.012	MC 30 Bitumen		litre	150.90	110	16,599	1kg = 1 litre 100 * 1.1 (loss margin) = 110
	Subtotal					19,789	
	Miscellaneous Cost		%		5	989	% of Subtotal
	Total					20,779	
	Per unit					208	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	567.5	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 100

Work Category Tack Coat
 Code 15.50.003
 Work Item Name Tack Coat (grade bitumen cutback)

Description Prepare surface of carriageway and bus bays, provide and spray 80/100 penetration grade bitumen cut back using 5-15% kerosene as tack coat for asphalt concrete wearing course at a spray rate of 0.5-0.7 litre/m²

Unit litre
 Quantity 60

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.04	79	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.12	170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.13	93	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716			
M1	Sprayer driving		Hour	959	2.97	2,848	Based on average estimated productivity in Japan (see note)
22.73.012	MC 30 Bitumen		litre	150.90	66	9,959	1kg = 1 litre 60 * 1.1 (loss margin) = 66
	Subtotal					13,150	
	Miscellaneous Cost		%		5	657	% of Subtotal
	Total					13,807	
	Per unit					230	Total/Quantity

Note

- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
- The unit price does not include haulage cost.
- Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Sprayer driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	567.5	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 101

Work Category Tack Coat
 Code 15.50.003a
 Work Item Name Tack Coat (bitumen emulsion)

Description Prepare surface of repair areas provide and spray K1-60 bitumen emulsion as tack coat or seal to repair areas at a spray rate of 0.8-1.0 litre/m²

Unit litre
 Quantity 90

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.04	79	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.12	170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.13	93	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716			
M1	Sprayer driving		Hour	959	2.97	2,848	Based on average estimated productivity in Japan (see note)
22.73.012	MC 30 Bitumen		litre	150.90	99	14,939	1kg = 1 litre 90 * 1.1 (loss margin) = 99
	Subtotal					18,129	
	Miscellaneous Cost		%		5	906	% of Subtotal
	Total					19,036	
	Per unit					212	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	567.5	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 102

Work Category Surface Dressing

Code 15.70.001

Work Item Name Seal coat

Description Cover a large worn surface area with aggregate distributed over spread bitumen to seal cracks and to recover adequate surface texture

Unit litre

Quantity 60

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.04	79	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1,417	0.12	170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.13	93	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Sprayer driving		Hour	959	2.97	2,848	Based on average estimated productivity in Japan (see note)
M2	Roller driving		Hour	5,439	0	0	Based on average estimated productivity in Japan (see note)
M3	Pneumatic roller driving		Hour	5,241	0	0	Based on average estimated productivity in Japan (see note)
22.73.012	MC 30 Bitumen		litre	151	99	14,939	1kg = 1 litre 90 * 1.1 (loss margin) = 99
	Subtotal					18,129	
	Miscellaneous Cost		%		5	906	% of Subtotal
	Total					19,036	
	Per unit					317	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and KRB 2011:1570002
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3,686	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Pneumatic roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.005	Pneumatic Roller: 10T, 130HP	0	Hour	3,488	1	3,488	
	Miscellaneous Cost		%	0	0		
	Total					5,241	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 103

Work Category Surface Dressing
 Code 15.60.002
 Work Item Name Provide and roll 3/6 mm precoated chipping

Description Treat worn surface with graded aggregates of 3 to 6mm precoated with bitumen to recover adequate surface texture

Unit m3 (5cm)

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.04	79	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1,417	0.12	170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.13	93	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.016	Coarse aggregates(chippings) - 3/6mm	0	m3	7,000	5.5	38,500	5*1.1 (loss margin) = 5.5
22.73.013	80/100 Pen grade bitumen		litre	133	99	13,127	1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Sprayer driving		Hour	959	0.5	480	Based on average productivity in Kenya
M2	Chip spreader driving		Hour	7,151	1	7,151	Based on average productivity in Kenya
M3	Pneumatic roller driving		Hour	5,241	0.55	2,883	Based on average productivity in Kenya
	Subtotal					62,483	
	Miscellaneous Cost		%		5	3,124	% of Subtotal
	Total					65,607	
	Per unit					13,121	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and KRB 2011:1570002
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 chip spreader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	5.33	734	Based on average fuel efficiency per horsepower in Japan 0.144l/hp*37hp = 5.33l
22.67.110	Chip spreader	0	Hour	6,167	1	6,167	
	Miscellaneous Cost		%	0	0		
	Total					7,151	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Pneumatic roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.005	Pneumatic Roller: 10T, 130HP	0	Hour	3,488	1	3,488	
	Miscellaneous Cost		%	0	0		
	Total					5,241	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 104

Work Category Surface Dressing

Code 15.60.003

Work Item Name Provide and roll 6/10 mm precoated chipping

Description Treat worn surface with graded aggregates of 6 to 10mm precoated with bitumen to recover adequate surface texture

Unit m3 (5cm)

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.04	79	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1,417	0.12	170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.13	93	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.017	Coarse aggregates(chippings) - 6/10mm	0	m3	7,000	5.5	38,500	5*1.1 (loss margin) = 5.5
22.73.013	80/100 Pen grade bitumen		litre	133	99	13,127	1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Sprayer driving		Hour	959	0.5	480	Based on average productivity in Kenya
M2	Chip spreader driving		Hour	7,151	1	7,151	Based on average productivity in Kenya
M3	Pneumatic roller driving		Hour	5,241	0.55	2,883	Based on average productivity in Kenya
	Subtotal					62,483	
	Miscellaneous Cost		%		5	3,124	% of Subtotal
	Total					65,607	
	Per unit					13,121	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and KRB 2011:1570002
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 chip spreader driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	5.33	734	Based on average fuel efficiency per horsepower in Japan 0.144l/hp*37hp = 5.33l
22.67.110	Chip spreader	0	Hour	6,167	1	6,167	
	Miscellaneous Cost		%	0	0		
	Total					7,151	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Pneumatic roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.005	Pneumatic Roller: 10T, 130HP	0	Hour	3,488	1	3,488	
	Miscellaneous Cost		%	0	0		
	Total					5,241	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 105

Work Category Surface Dressing

Code 15.60.004

Work Item Name Provide and roll 10/14 mm precoated chipping

Description Treat worn surface with graded aggregates of 10 to 14mm precoated with bitumen to recover adequate surface texture

Unit m3 (5cm)

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.04	79	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1,417	0.12	170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.13	93	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.018	Coarse aggregates(chippings) - 10/14mm	0	m3	8,000	5.5	44,000	5*1.1 (loss margin) = 5.5
22.73.013	80/100 Pen grade bitumen		litre	133	99	13,127	1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Sprayer driving		Hour	959	0.5	480	Based on average productivity in Kenya
M2	Chip spreader driving		Hour	7,151	1	7,151	Based on average productivity in Kenya
M4	Pneumatic roller driving		Hour	5,241	0.33	1,730	Based on average productivity in Kenya
	Subtotal					66,830	
	Miscellaneous Cost		%		5	3,341	% of Subtotal
	Total					70,171	
	Per unit					14,034	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and KRB 2011:1570002
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 chip spreader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	5.33	734	Based on average fuel efficiency per horsepower in Japan 0.144l/hp*37hp = 5.33l
22.67.110	Chip spreader	0	Hour	6,167	1	6,167	
	Miscellaneous Cost		%	0	0		
	Total					7,151	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M4 Pneumatic roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.005	Pneumatic Roller: 10T, 130HP	0	Hour	3,488	1	3,488	
	Miscellaneous Cost		%	0	0		
	Total					5,241	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 106

Work Category Surface Dressing
 Code 15.60.005
 Work Item Name Provide and roll 14/20 mm precoated chipping

Description Treat worn surface with graded aggregates of 14 to 20mm precoated with bitumen to recover adequate surface texture

Unit m3 (5cm)
 Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.04	79	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1,417	0.12	170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.13	93	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.72.019	Coarse aggregates(chippings) - 14/20mm	0	m3	9,500	5.5	52,250	5*1.1 (loss margin) = 5.5
22.73.013	80/100 Pen grade bitumen		litre	133	99	13,127	1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Sprayer driving		Hour	959	0.5	480	Based on average productivity in Kenya
M2	Chip spreader driving		Hour	7,151	1	7,151	Based on average productivity in Kenya
M3	Pneumatic roller driving		Hour	5,241	0.33	1,730	Based on average productivity in Kenya
	Subtotal					75,080	
	Miscellaneous Cost		%		5	3,754	% of Subtotal
	Total					78,834	
	Per unit					15,767	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and KRB 2011:1570002
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Chip spreader driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	5.33	734	Based on average fuel efficiency per horsepower in Japan 0.144ℓ/hp*37hp = 5.33ℓ
22.67.110	Chip spreader	0	Hour	6,167	1	6,167	
	Miscellaneous Cost		%	0	0		
	Total					7,151	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Pneumatic roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.005	Pneumatic Roller: 10T, 130HP	0	Hour	3,488	1	3,488	
	Miscellaneous Cost		%	0	0		
	Total					5,241	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 107a

Work Category Pavement Repairing
 Code 16.50.001a
 Work Item Name Pothole Cutting and Cleaning

Description Pothole Cutting and Cleaning

Unit m³
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer	Foreman	Person Day	1975	0.3	494	Based on average productivity in Kenya
22.50.005	Artisans G2	Supervisor	Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.0	2,148	Based on average productivity in Kenya
M1	Asphalt cutter driving		Hour	1994	8.00	15,952	Based on average productivity in Kenya
	Subtotal					19,302	
	Miscellaneous Cost		%		5	965	% of Subtotal
	Total					20,267	
	Per unit					2,027	Total/Quantity

M1 Asphalt cutter driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.143	286	1day = 7 hours 1hour = 0.143 day
22.74.002	Fuel	Diesel	litre	138	1.451	200	
22.67.109	Asphalt/Bitumen cutter		Hour	1,508	1	1,508	
	Miscellaneous Cost		%	0	0		
	Total					1994	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 107

Work Category Pavement Repairing
 Code 16.50.001
 Work Item Name Pothole patching - hot mix

Description Provide, place and compact asphaltic concrete to repair areas and for regulation to carriageway

Unit m³
 Quantity 5 (thickness=5cm)

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.20	395	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1,417	0.21	301	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	1.88	1,348	Based on average productivity in Kenya
22.73.003	Premix - AC Type I (hot)		m3	22,414	5.50	123,276	5*1.1 (loss margin) = 5.5
22.79.161	K-160		litre	134	99.00	13,236	1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Sprayer driving		Hour	959	0.23	221	
M2	Truck Driving		Hour	3,503	0.45	1,564	
M3	Roller driving		Hour	5,439	0.27	1,466	
	Subtotal					141,807	
	Miscellaneous Cost		%		5	7,090	% of Subtotal
	Total					148,897	
	Per unit					29,779	Total/Quantity

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.50.002	Unskilled labour		Person Day	716	0.00	0	
22.74.002	Fuel	Diesel	litre	138	1.030	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0	0	
	Total					959	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Truck driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.74.002	Fuel	Diesel	litre	138	5.320	733	Based on average fuel efficiency per horsepower in Japan 0.041ℓ/hp*133hp=5.32 ℓ
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes		Hour	2,520	1	2,520	
	Miscellaneous Cost		%	0	0		
	Total					3,503	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.50.002	Unskilled labour		Person Day	716	0.00	0	
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP		Hour	3,686	1	3,686	
	Miscellaneous Cost		%	0	0	0	
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 108

Work Category Pavement Repairing
 Code 16.50.001
 Work Item Name Pothole patching - cold mix

Description Repair defects on bituminous surface by cold bituminous mixture

Unit m³
 Quantity 5 (thickness=5cm)

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.20	395	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1,417	0.21	301	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	1.88	1,348	Based on average productivity in Kenya
22.73.002	Premix - AC Type I (cold)		m3	40,000	5.5	220,000	5*1.1 (loss margin) = 5.5
22.73.012	MC 30 Bitumen		litre	151	99	14,939	1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Sprayer driving		Hour	959	0.23	221	
M2	Truck Driving		Hour	3,503	0.45	1,576	
M3	Roller driving		Hour	5,439	0.27	1,466	
	Subtotal					240,246	
	Miscellaneous Cost		%		5	12,012	% of Subtotal
	Total					252,258	
	Per unit					50,452	Total/Quantity

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.50.002	Unskilled labour		Person Day	716	0.00	0	
22.74.002	Fuel	Diesel	litre	138	1.030	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0	0	
	Total					959	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Truck driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.74.002	Fuel	Diesel	litre	138	5.320	733	Based on average fuel efficiency per horsepower in Japan 0.041ℓ/hp*133hp=5.32 ℓ
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes		Hour	2,520	1	2,520	
	Miscellaneous Cost		%	0	0		
	Total					3,503	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.50.002	Unskilled labour		Person Day	716	0.00	0	
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP		Hour	3,686	1	3,686	
	Miscellaneous Cost		%	0	0	0	
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 109

Work Category Pavement Repairing

Code 16.50.004

Work Item Name Crack sealing

Description Repair transverse or longitudinal cracking on surface dressed or asphalt concrete

Unit m
Quantity 2,000

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	19	37,525	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0	0	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	63	45,108	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.73.013	80/100 Pen grade bitumen		litre	132.60	194	25,724	Based on average productivity in Kenya
22.72.020	Stone dust		m3	1149.8	16	18,397	Based on average productivity in Kenya
M1	Compressor driving		Day	25,167	8.22	206,873	Based on average productivity in Kenya
M2	Pick Up Driving		Hour	7,514	8.22	61,765	Based on average productivity in Kenya
	Subtotal					395,392	
	Miscellaneous Cost		%		5	19,770	% of Subtotal
	Total					415,162	
	Per unit					208	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and KRB 2011:1570002
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Compressor driving

Per day

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	1	2,000	
22.74.002	Fuel	Diesel	litre	137.7	79.1	10,892	Based on average fuel efficiency per horsepower in Japan 0.211l/hp*50hp*7.5hr=79.1l
22.67.108	Air compressor	150CFM, 4250LPM	Day	12275	1	12,275	
	Miscellaneous Cost		%	0	0		
	Total					25,167	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Pick Up Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	6	826	Travelling at 60 km/hr, with a consumption of 10 km/litre; (60 km/hr)/10 km/ litre = 6 litre
22.79.155	Pick up truck	0 day		6437.5	1	6,438	
	Miscellaneous Cost		%	0	0		
	Total					7,514	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 110

Work Category Pavement Repairing
 Code 16.60.001
 Work Item Name Asphalt concrete for surfacing - hot mix.

Description Overlay or continuously repave surface by hot bituminous mixture

Unit m3 (5cm)
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1,417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.73.003	Premix - AC Type I (hot)		m3	22,414	110	2,465,518	5*1.1 (loss margin) = 5.5
22.73.012	MC 30 Bitumen		litre	151	1980	298,782	1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Sprayer driving		Hour	959	6	5,754	Based on average productivity in Kenya
M2	Asphalt finisher driving		Hour	7,484	6	44,904	Based on average productivity in Kenya
M3	Roller driving		Hour	5,439	6	32,635	Based on average productivity in Kenya
M4	Pneumatic roller driving		Hour	5,241	6	31,447	Based on average productivity in Kenya
	Subtotal					2,889,562	
	Miscellaneous Cost		%		5	144,478	% of Subtotal
	Total					3,034,040	
	Per unit					30,340	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and KRB 2011:1570002
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0		
	Total					959	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Asphalt finisher driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	5.33	734	Based on average fuel efficiency per horsepower in Japan 0.144l/hp*37hp = 5.33l
22.67.104	Asphalt finisher	37H	Hour	6,500	1	6,500	
	Miscellaneous Cost		%	0	0		
	Total					7,484	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3,686	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M4 Pneumatic roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084l/hp*130hp=10.92l
22.64.005	Pneumatic Roller: 10T, 130HP	0	Hour	3,488	1	3,488	
	Miscellaneous Cost		%	0	0		
	Total					5,241	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 111

Work Category Pavement Repairing

Code 16.70.001

Work Item Name Base repair - Dense Bitumen Macadam (DBM)

Description Place dense bitumen macadam for base material and roll

Unit m3 (5cm)

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1,417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.73.004	Dense Bitumen Macadam		m3	22,414	110	2,465,518	5*1.1 (loss margin) = 5.5
22.73.012	MC 30 Bitumen		litre	151	1980	298,782	1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Sprayer driving		Hour	959	6	5,754	Based on average productivity in Kenya
M2	Asphalt finisher driving		Hour	7,484	6	44,904	Based on average productivity in Kenya
M3	Roller driving		Hour	5,439	6	32,635	Based on average productivity in Kenya
M4	Pneumatic roller driving		Hour	5,241	6	31,447	Based on average productivity in Kenya
	Subtotal					2,889,562	
	Miscellaneous Cost		%		5	144,478	% of Subtotal
	Total					3,034,040	
	Per unit					30,340	Total/Quantity

Note

- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and KRB 2011:1570002
- The unit price does not include haulage cost.
- Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Sprayer driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.004	Bitumen Sprayer H/Operated	200L	Hour	568	1	568	
	Miscellaneous Cost		%	0	0	0	
	Total					959	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Asphalt finisher driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	5.33	734	Based on average fuel efficiency per horsepower in Japan 0.144ℓ/hp*37hp = 5.33ℓ
22.67.104	Asphalt finisher	37H	Hour	6,500	1	6,500	
	Miscellaneous Cost		%	0	0	0	
	Total					7,484	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3,686	1	3,686	
	Miscellaneous Cost		%	0	0		
	Total					5,439	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M4 Pneumatic roller driving

							Per hour
Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,504	Based on average fuel efficiency per horsepower in Japan 0.084ℓ/hp*130hp=10.92ℓ
22.64.005	Pneumatic Roller: 10T, 130HP	0	Hour	3,488	1	3,488	
	Miscellaneous Cost		%	0	0		
	Total					5,241	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 112

Work Category Milling and Paving

Code 16.80.010

Work Item Name Milling the existing bituminous layer to spoil

Description Mill mechanically the existing bituminous layer to spoil

Unit m3

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.13	257	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.40	567	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.95	680	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Excavator Driving	197hp	Hour	10,258	0.62	6,360	Based on average estimated productivity in Japan (see note)
M2	Milling machine Driving		Hour	7,850	1	7,850	Based on average productivity in Kenya
	Subtotal					15,714	
	Miscellaneous Cost		%		5	786	
	Total					16,499	10m3
	Per unit					3,300	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Excavator Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	26.32	3,624	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*140hp=26.32l
22.63.102	Excavator	130-150hp	Hour	6383.4	1	6,383	
	Miscellaneous Cost		%	0	0		
	Total					10,258	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Milling machine Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	37.04	5,100	Based on average fuel efficiency per horsepower in Japan 0.188l/hp*197hp=37.04l
22.67.101	Milling machine	197hp	Hour	2500	1	2,500	
	Miscellaneous Cost		%	0	0		
	Total					7,850	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 113

Work Category Milling and Paving

Code 16.80.015

Work Item Name Milling the existing bituminous layer for reuse

Description Mill mechanically the existing bituminous layer and stockpile for reuse or recycle

Unit m3

Quantity 5

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.13	257	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1,417	0.40	567	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.95	680	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.002	Graded aggregates (ballast)		m3	1,212	1.65	1,999	Additional aggregates 1.5 * 1.1 (loss margin) = 1.65
22.73.012	MC 30 Bitumen		litre	151	99	14,939	Additional bitumen 1kg = 1 litre 90 * 1.1 (loss margin) = 99
M1	Road heater driving	197hp	Hour	23,992	1.03	24,712	Based on average estimated productivity in Japan (see note)
M2	Resurface machine driving		Hour	31,002	0.51	15,811	Based on average estimated productivity in Japan (see note)
M3	Roller driving		Hour	3,168	0.51	1,616	Based on average estimated productivity in Japan (see note)
M4	Pneumatic roller driving		Hour	3,149	0.51	1,606	Based on average estimated productivity in Japan (see note)
	Subtotal					62,186	
	Miscellaneous Cost		%		5	3,109	Subtotal*0.10
	Total					65,296	
	Per unit					13,059	Total/Quantity

- Note**
- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - The unit price does not include haulage cost.
 - Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Road heater driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	7.56	751	Based on average fuel efficiency per horsepower in Japan 0.120ℓ*63hp=7.56ℓ
22.67.103	Road heater	63hp	Hour	26,655	1	23,100	
	Miscellaneous Cost		%	0	0		
	Total					23,992	

- Note**
- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Resurface machine driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	12.84	1,276	Based on average fuel efficiency per horsepower in Japan $0.107\text{t/hp} \times 120\text{hp} = 12.84\text{t}$
22.67.102	Resurface machine	120hp	Hour	31,986	1	29,600	
	Miscellaneous Cost		%	0	0		
	Total					31,002	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,085	Based on average fuel efficiency per horsepower in Japan $0.084\text{t/hp} \times 130\text{hp} = 10.92\text{t}$
22.64.004	Single drum steel Vibrator roller: 9-10T, 130 HP	0	Hour	3,686	1	1,942	
	Miscellaneous Cost		%	0	0		
	Total					3,168	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M4 Pneumatic roller driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	10.92	1,085	Based on average fuel efficiency per horsepower in Japan $0.084\text{t/hp} \times 130\text{hp} = 10.92\text{t}$
22.64.005	Pneumatic Roller: 10T, 130HP	0	Hour	3,488	1	1,923	
	Miscellaneous Cost		%	0	0		
	Total					3,149	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 114

Work Category Concrete Work
 Code 17.60.001
 Work Item Name Concrete work (class 15/20)

Description Provide, place and compact class 15/20 concrete mixture for blinding.

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B1	Concrete mix work		m3	10,707	10	107,070	
B2	Concrete curing		m3	124	10	1,240	Based on average productivity in Kenya
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B1 Concrete mix work

Unit m3
 Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B2 Concrete curing

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 115

Work Category Concrete Work
 Code 17.60.002
 Work Item Name Concrete work (class 20/20)

Description Provide, place and compact class 20/20 concrete mixture.

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.43	2,824	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1.98	2,806	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B1	Concrete mix work		m3	11,591	10	115,910	
B2	Concrete curing		m3	124	10	1,240	Based on average estimated productivity in Japan (see note)
	Subtotal					125,021	
	Miscellaneous Cost		%		10	12,502	% of Subtotal
	Total					137,523	
	Per unit					13,752	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B1 Concrete mix work
 Unit m3
 Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	319	4,402	290 * 1.1 (loss margin) = 319
22.69.009	Fine aggregates(sand)		m3	1793.6	0.46	825	0.42 * 1.1 (loss margin) = 0.462
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.88	1,066	0.80*1.1 (loss margin) = 0.88
	Subtotal					11,591	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					11,591	
	Per unit					11,591	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B2 Concrete curing
 Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 116

Work Category Concrete Work
 Code 17.60.002a
 Work Item Name Concrete work (class 25/20)

Description Provide, place and compact class 25/20 concrete mixture.

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	6	4,296	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
B1	Concrete mix work		m3	12,616	10	126,160	
B2	Concrete curing		m3	124	10	1,240	Based on average estimated productivity in Japan (see note)
	Subtotal					139,897	
	Miscellaneous Cost		%		10	13,990	% of Subtotal
	Total					153,887	
	Per unit					15,389	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B1 Concrete mix work
 Unit m3
 Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	402	5,548	365*1.1 (loss margin) = 401.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.42	753	0.38*1.1 (loss margin) = 0.418
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.84	1,018	0.76*1.1 (loss margin) = 0.836
	Subtotal					12,616	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					12,616	
	Per unit					12,616	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B2 Concrete curing
 Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 117

Work Category Formwork
 Code 17.60.003
 Work Item Name Vertical formwork class F2 finish

Description Provide and erect formwork of class F2 finish to the vertical direction

Unit m2 (W=1.0m)
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2	3,950	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	4	5,668	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	8	5,728	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					183,346	
	Miscellaneous Cost		%		10	18,335	% of Subtotal
	Total					201,681	
	Per unit					2,017	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 118

Work Category Formwork
 Code 17.60.004
 Work Item Name Horizontal formwork class F2 finish

Description Provide and erect formwork of class F2 finish to the horizontal direction

Unit m2 (H=1.0m)

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100 * 1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 119

Work Category Reinforcement

Code 17.80.004

Work Item Name Reinforcement work (below 16mm)

Description Provide, cut bend and fix into position high yield reinforcement bar below 16mm

Unit ton

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.25	3,188	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.71.012	Square twisted bars 16mm		t	124344.2	1.10	136,779	1*1.1 (loss margin) = 1.1
	price adjustment		%		3	(4,103)	deduction to above 16mm price
	Subtotal					141,912	
	Miscellaneous Cost		%		10	14,191	% of Subtotal
	Total					156,103	
	Per unit					156,103	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 120

Work Category Reinforcement
 Code 17.80.005
 Work Item Name Reinforcement work (above 16mm)

Description Provide, cut bend and fix into position high yield reinforcement bar above 16mm

Unit ton
 Quantity 1

B3 Reinforcement

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.25	3,188	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.71.012	Square twisted bars 16mm		t	124344.2	1.1	136,779	1*1.1 (loss margin) = 1.1
	price adjustment		%		3	4,103	adjust to above 16mm price
	Subtotal					150,119	
	Miscellaneous Cost		%		10	15,012	% of Subtotal
	Total					165,131	
	Per unit					165,131	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 121

Work Category Boundary posts

Code 20.50.001

Work Item Name Road reserve boundary posts

Description Provide and erect road reserve boundary posts (size 1.2 x 0.2 x 0.2)

Unit No.

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Form work		m2	1,932	50	96,600	$(0.2 \text{ (post width)} * 4 * 1.2 \text{ (post height)} + 0.45 \text{ (base width)} * 4 * 0.35 \text{ (base height)}) * 100 = 159$; form work to be reused = set area to 50
B2	Concrete casting Class 20/20	for post	m3	13,752	4.8	66,010	(for post) $0.2 * 0.2 * 1.2 * 100 = 4.8$
B5	Concrete casting Class 15/20	for base	m3	12,293	5.9	72,529	(for base) $(0.45 * 0.45 * 0.35 - 0.2 * 0.2 * 0.3 \text{ (post submerged depth)}) * 100 = 5.89$
B8	Reinforcement (below 16mm)	R16,R8	t	156,103	0.376	58,695	$((1.1 \text{ (bar length)} * 4 + 0.1 \text{ (bend length)} * 4) * 0.56 \text{ kg/m (for main bars)} + 0.1 \text{ (vertical rebar gap)} * 4 * 0.448 \text{ kg/m (for hoop)} * 6 \text{ (No. of links)} * 100 = 376.32 \text{ kg})$
	Total					293,833	
	Per unit					2,938	Total/Quantity

Note 1.The unit price does not include haulage cost.

B1 Form work

Unit m2 (H=1.0m)

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	$100 * 1.2 \text{ (loss margin)} = 120$
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note 1.The unit price does not include haulage cost.
 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Concrete casting Class 20/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.43	2,824	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1.98	2,806	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B3	Concrete mix work		m3	11,591	10	115,910	
B4	Concrete curing		m3	124	10	1,240	
	Subtotal					125,021	
	Miscellaneous Cost		%		10	12,502	% of Subtotal
	Total					137,523	
	Per unit					13,752	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	319	4,402	290*1.1 (loss margin) = 319
22.69.009	Fine aggregates(sand)		m3	1793.6	0.46	825	0.42*1.1 (loss margin) = 0.462
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.88	1,066	0.80*1.1 (loss margin) = 0.88
	Subtotal					11,591	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					11,591	
	Per unit					11,591	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B4 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B5 Concrete casting Class 15/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B6	Concrete mix work		m3	10,707	10	107,070	
B7	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B6 Concrete mix work

Unit m3
Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B7 Concrete curing

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B8 Reinforcement (below 16mm)

Unit ton

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.25	3,188	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.71.012	Square twisted bars 16mm		t	124344.2	1.1	136,779	1*1.1 (loss margin)
	price adjustment		%		3	(4,103)	deduction to above 16mm price
	Subtotal					141,912	
	Miscellaneous Cost		%		10	14,191	
	Total					156,103	
	Per unit					156,103	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

No. 122

Work Category Boundary posts
 Code 20.50.004
 Work Item Name Edge marker posts

Description Provide and erect edge marker posts

Unit No.
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	3.3	6,518	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	3.3	4,676	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	6.7	4,797	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716		15,991	
22.79.013	Reflective mark posts	White PVC post 1400	No.	3344.1	100	334,410	
	Subtotal					366,392	
	Miscellaneous Cost		%		5	18,320	% of Subtotal
	Total					384,711	
	Per unit					3,847	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 123

Work Category Road Marking
 Code 20.50.007
 Work Item Name Roads markings - white paint

Description Provide reflectorized white paint for road markings (w = 10cm)

Unit m² (w = 10cm)
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.33	4,602	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.33	3,302	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	6.98	4,998	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Road Marking Machine Driving		Hour	992	3.01	2,986	Based on average estimated productivity in Japan (see note)
M2	truck driving		Hour	3,503	3.01	10,544	(For haulage within site) Based on average estimated productivity in Japan (see note)
22.79.004	Road marking paint white		litre	950	44	41,809	40*1.1 (loss margin) = 44
	Subtotal					68,240	
	Miscellaneous Cost		%		5	3,412	% of Subtotal
	Total					139,892	
	Per unit					1,399	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and M.o.P.W.:1988: Activity No. 30201
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Road Marking Machine Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	0	0	Based on average fuel efficiency per horsepower in Japan 0.03ℓ/hp*50hp=1.5ℓ
22.65.008	Road Marking Machine	0	Hour	741.7	1	742	
	Miscellaneous Cost		%	0	0	0	
	Total					992	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Truck driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	5.32	733	Based on average fuel efficiency per horsepower in Japan 0.041ℓ/hp*133hp=5.32ℓ
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes		Hour	2520	1	2,520	
	Miscellaneous Cost		%	0	0	0	
	Total					3,503	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 124

Work Category Road Marking

Code 20.70.011

Work Item Name Road markings - white thermoplastic material

Description Renew faded or missing white road markings (w = 10cm) with thermoplastic material

Unit m² (w = 10cm)

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.42	833	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.00	0	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2.05	1,465	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Road Marking Machine Driving		Hour	992	1.14	1,126	Based on average estimated productivity in Japan (see note)
M2	Truck driving		Hour	3,555	0.76	2,698	(For haulage within site) Based on average estimated productivity in Japan (see note)
M3	Melting pod driving	200 - 350kg	Hour	2,833	1.15	3,252	Based on average estimated productivity in Japan (see note)
22.79.006	Thermoplastic paint white	premixed with primer and glass beads	Kg	362	660	238,920	Based on average estimated productivity in Japan (see note) 600 * 1.1 (loss margin) = 660
	Subtotal					248,293	
	Miscellaneous Cost		%		5	12,415	% of Subtotal
	Total					260,708	
	Per unit					2,607	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and M.o.P.W.:1988: Activity No. 30201
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Road Marking Machine Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	0	0	
22.65.008	Road Marking Machine	0	Hour	741.7	1	742	Refer to Japanese price and convert it to hire rate
	Miscellaneous Cost		%	0	0	0	
	Total					992	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Truck driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	5.70	785	Based on actual productivity survey
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes	0	Hour	2520	1	2,520	Refer to Japanese price and convert it to hire rate
	Miscellaneous Cost		%	0	0	0	
	Total					3,555	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Melting pod driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	
22.65.101	Melting pod (for paint)	200 - 350kg	Hour	2583.4	1	2,583	Refer to Japanese price and convert it to hire rate
	Miscellaneous Cost		%	0	0	0	
	Total					2,833	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 124a

Work Category Road Marking

Code 20.70.011a

Work Item Name Road markings on surface dressed pavement- white thermoplastic material

Description Renew faded or missing white road markings on surface dressed pavement (w = 10cm) with thermoplastic material

Unit m²

Quantity 100

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.173	342	Based on actual surveyed productivity rate
22.50.005	Artisans G2		Person Day	1,417	0.000	0	Based on actual surveyed productivity rate
22.50.002	Unskilled labour		Person Day	716	4.277	3,062	Based on actual surveyed productivity rate
22.79.006	Thermoplastic paint white		Kg	362	726.6	263,043	Based on actual surveyed productivity rate
22.79.162	Reflecting Glass Beads		kg	165	9.94	1,642	Based on actual surveyed productivity rate
M1	Compressor Driving		Day	13,261	0.28	3,690	Based on actual surveyed productivity rate for cleaning
M2	Road Marking Machine Driving		Hour	992	0.512	507	Based on actual surveyed productivity rate
M3	Melting pod driving		Hour	2,833	0.948	2,686	Based on actual surveyed productivity rate for Melting pod
M4	Truck driving	3~3.5t	Hour	3,503	0.564	1,976	
	Subtotal					276,948	
	Miscellaneous Cost		%	0	5.00	13,847	% of Subtotal
	Total					290,796	
	Per unit					2,908	Total/Quantity

Note

1. 2t truck is for hauling equipments and materials, 3~3.5t truck is for the fusion movement in the site.
2. Quantity of materials shall include the loss margin.
3. Not including the traffic control, haulage cost.
4. Miscellaneous Cost is for the minor equipments, materials and supplementary work such as primer, gas, stick chalk and so on.

M1 Compressor Driving

Per Day

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	5.3	736	
22.67.108	Air compressor	150CFM, 4250LPM	Day	12,275	1	12,275	
	Miscellaneous Cost		%	0	0	0	
	Total					13,261	

M2 Road Marking Machine Driving

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.65.008	Road Marking Machine		Hour	742	1	742	
	Miscellaneous Cost		%	-	0	0	
	Total					992	

M3 Melting pod driving

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000.00	0.125	250	1day = 8 hours 1hour = 0.125day
22.65.101	Melting pod (for paint)	200 - 350kg	Hour	2,583.40	1	2,583	
	Miscellaneous Cost		%	-	0	0	
	Total					2,833	

M4 Truck driving

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000.00	0.125	250	1day = 7 hours 1hour = 0.143day
22.74.002	Fuel	Diesel	litre	137.70	5.32	733	0.041l/hp*133hp=5.32l
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes	0	Hour	2,520.00	1	2,520	
	Miscellaneous Cost		%	-	0	0	
	Total					3,503	

No. 125

Work Category Road Marking
 Code 20.50.006
 Work Item Name Road markings - yellow paint

Description Provide reflectorized yellow paint for road markings (w = 10cm)

Unit m² (w = 10cm)
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.33	4,602	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.33	3,302	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	6.98	4,998	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Road Marking Machine Driving		Hour	992	3.01	2,986	Based on average estimated productivity in Japan (see note)
M2	truck driving		Hour	3,503	3.01	10,544	(For haulage within site) Based on average estimated productivity in Japan (see note)
22.79.004	Road marking paint white	0 litre		950.2	44	41,809	40*1.1 (loss margin) = 44
	Subtotal					68,240	
	Miscellaneous Cost		%		5	3,412	% of Subtotal
	Total					139,892	
	Per unit					1,399	Total/Quantity

Note

- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and M.o.P.W.:1988: Activity No. 30201
- The unit price does not include haulage cost.
- Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Road Marking Machine Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	0	0	Based on average fuel efficiency per horsepower in Japan 0.03l/hp*50hp=1.5l
22.65.008	Road Marking Machine	0 Hour		741.7	1	742	
	Miscellaneous Cost		%	0	0	0	
	Total					992	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Truck driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	5.32	733	Based on average fuel efficiency per horsepower in Japan 0.041l/hp*133hp=5.32l
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes	0 Hour		2520	1	2,520	
	Miscellaneous Cost		%	0	0	0	
	Total					3,503	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 126

Work Category Road Marking

Code 20.70.010

Work Item Name Road markings - yellow thermoplastic material

Description Upgrade faded or missing yellow road markings (w = 10cm) with thermoplastic material

Unit m2 (w = 10cm)

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.42	833	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.00	0	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2.05	1,465	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0.00	0	
M1	Road Marking Machine Driving		Hour	992	1.14	1,126	Based on average estimated productivity in Japan (see note)
M2	truck driving		Hour	3,555	0.76	2,698	(For haulage within site) Based on average estimated productivity in Japan (see note)
M3	Melting pod driving	200 - 350kg	Hour	2,833	1.15	3,252	Based on average estimated productivity in Japan (see note)
22.79.005	Thermoplastic paint yellow	premixed with primer and glass beads	Kg	388	660	256,080	Based on average estimated productivity in Japan (see note) 600 * 1.1 (loss margin) = 660
	Subtotal					265,453	
	Miscellaneous Cost		%		5	13,273	% of Subtotal
	Total					278,726	
	Per unit					2,787	Total/Quantity

Note

- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and M.o.P.W.:1988: Activity No. 30201
- The unit price does not include haulage cost.
- Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Road Marking Machine Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	0	0	Based on average fuel efficiency per horsepower in Japan 0.03l/hp*50hp=1.5l
22.65.008	Road Marking Machine	0	Hour	741.7	1	742	
	Miscellaneous Cost		%	0	0	0	
	Total					992	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Truck driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	5.7	785	Based on average fuel efficiency in Kenya
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes	0	Hour	2520	1	2,520	
	Miscellaneous Cost		%	0	0	0	
	Total					3,555	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Melting pod driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.65.101	Melting pod (for paint)	200 - 350kg	Hour	2583.4	1	2,583	Refer to Japanese price and convert it to hire rate
	Miscellaneous Cost		%	0	0	0	
	Total					2,833	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 126a

Work Category Road Marking

Code 20.70.010a

Work Item Name Road markings on surface dressed pavement- yellow thermoplastic material

Description Renew faded or missing yellow road markings on surface dressed pavement (w = 10cm) with thermoplastic material

Unit m²

Quantity 100

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1,975	0.173	342	Based on actual surveyed productivity rate
22.50.005	Artisans G2		Person Day	1,417	0.000	0	Based on actual surveyed productivity rate
22.50.002	Unskilled labour		Person Day	716	4.277	3,062	Based on actual surveyed productivity rate
22.79.005	Thermoplastic paint yellow		Kg	388	726.6	281,935	Based on actual surveyed productivity rate
22.79.162	Reflecting Glass Beads		kg	165	9.94	1,642	Based on actual surveyed productivity rate
M1	Compressor Driving		Day	13,261	0.28	3,690	for cleaning
M2	Road Marking Machine Driving		Hour	992	0.512	507	Based on actual surveyed productivity rate
M3	Melting pod driving		Hour	2,833	0.948	2,686	Based on actual surveyed productivity rate
M4	Truck driving	3~3.5t	Hour	3,503	0.564	1,976	for Melting pod
	Subtotal					295,841	
	Miscellaneous Cost		%	0	5.00	14,792	% of Subtotal
	Total					310,633	
	Per unit					3,106	Total/Quantity

Note

1. 2t truck is for hauling equipments and materials, 3~3.5t truck is for the fusion movement in the site.
2. Quantity of materials shall include the loss margin.
3. Not including the traffic control, haulage cost.
4. Miscellaneous Cost is for the minor equipments, materials and supplementary work such as primer, gas, stick chalk and so on.

M1 Compressor Driving

Per Day

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	138	5.3	736	
22.67.108	Air compressor	150CFM, 4250LPM	Day	12,275	1	12,275	
	Miscellaneous Cost		%	0	0	0	
	Total					13,261	

M2 Road Marking Machine Driving

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125day
22.65.008	Road Marking Machine		Hour	742	1	742	
	Miscellaneous Cost		%	-	0	0	
	Total					992	

M3 Melting pod driving

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000.00	0.125	250	1day = 8 hours 1hour = 0.125day
22.65.101	Melting pod (for paint)	200 - 350kg	Hour	2,583.40	1	2,583	
	Miscellaneous Cost		%	-	0	0	
	Total					2,833	

M4 Truck driving

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000.00	0.125	250	1day = 7 hours 1hour = 0.143day
22.74.002	Fuel	Diesel	litre	137.70	5.32	733	0.041l/hp*133hp=5.32l
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes	0 Hour		2,520.00	1	2,520	
	Miscellaneous Cost		%	-	0	0	
	Total					3,503	

No. 127

Work Category Road Marking
 Code 20.50.107
 Work Item Name Road marking black paint

Description Provide reflectorized black paint for road markings (w = 10cm)

Unit m² (w = 10cm)
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.33	4,602	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.33	3,302	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	6.98	4,998	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Road Marking Machine Driving		Hour	1,198	3.01	3,606	Based on average estimated productivity in Japan (see note)
M2	truck driving		Hour	3,503	3.01	10,544	(For haulage within site) Based on average estimated productivity in Japan (see note)
22.79.101	Road marking paint black	0 litre		969.50	44	42,658	40*1.1 (loss margin) = 44
	Subtotal					69,709	
	Miscellaneous Cost	%			5	3,485	% of Subtotal
	Total					142,904	
	Per unit					1,429	Total/Quantity

Note

- Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA) and M.o.P.W.:1988: Activity No. 30201
- The unit price does not include haulage cost.
- Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Road Marking Machine Driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.5	207	Based on average fuel efficiency per horsepower in Japan 0.03ℓ/hp*50hp=1.5ℓ
22.65.008	Road Marking Machine	0 Hour		741.7	1	742	
	Miscellaneous Cost	%		0	0	0	
	Total					1,198	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Truck driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	5.32	733	Based on average fuel efficiency per horsepower in Japan 0.041ℓ/hp*133hp=5.32ℓ
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes	0 Hour		2520	1	2,520	
	Miscellaneous Cost	%		0	0	0	
	Total					3,503	

Note

- Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 128

Work Category Road Sign Erection

Code 20.70.002

Work Item Name Warning signs

Description Provide and erect priority, prohibitory or mandatory signs

Unit No.

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	14.6	10,454	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.79.142	Warning triangular sign	600mm	No.	14030.1	10	140,301	
B1	Concrete casting Class 15/20		m3	12,293	4	49,172	Based on average productivity in Kenya
	Subtotal					199,927	
	Miscellaneous Cost		%		10	19,993	% of Subtotal
	Total					219,919	
	Per unit					21,992	Total/Quantity

- Note**
1. The quantities are based on KRB2011: Activity No.2080001,2050001
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 10%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 20%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B1 Concrete casting Class 15/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B2	Concrete mix work		m3	10,707	10	107,070	
B3	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 10%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 20%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B3 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 129

Work Category Road Sign Erection
 Code 20.70.005
 Work Item Name Priority, prohibitory or mandatory signs

Description Priority, prohibitory or mandatory signs

Unit No.
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	14.6	10,454	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716			
22.79.143	Priority triangular sign	600mm	No.	14030.1	10	140,301	
B1	Concrete casting Class 15/20		m3	12,293	4	49,172	Based on average productivity in Kenya
	Subtotal					199,927	
	Miscellaneous Cost		%		10	19,993	% of Subtotal
	Total					219,919	
	Per unit					21,992	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B1 Concrete casting Class 15/20

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B2	Concrete mix work		m3	10,707	10	107,070	
B3	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 10%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 20%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B3 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 130

Work Category Road Sign Erection
 Code 20.70.004
 Work Item Name Standard informatory signs

Description Provide and erect informatory signs

Unit No.
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	14.6	10,454	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716			
22.79.144	Standard informatory sign		No.	13795.9	10	137,959	
B1	Concrete casting Class 15/20		m3	12,293	4	49,172	Based on average productivity in Kenya
	Subtotal					197,585	
	Miscellaneous Cost		%		10	19,758	% of Subtotal
	Total					217,343	
	Per unit					21,734	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B1 Concrete casting Class 15/20

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B2	Concrete mix work		m3	10,707	10	107,070	
B3	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B3 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 131

Work Category Road Sign Erection
 Code 20.70.006
 Work Item Name Non-standard informatory signs

Description Provide and erect non-standard warning signs

Unit No.
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	14.6	10,454	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716			
22.79.145	Non-standard informatory sign	less than 1m2	No.	27441.3	10	274,413	
B1	Concrete casting Class 15/20		m3	12,293	4	49,172	Based on average productivity in Kenya
	Subtotal					334,039	
	Miscellaneous Cost		%		10	33,404	% of Subtotal
	Total					367,442	
	Per unit					36,744	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B1 Concrete casting Class 15/20

Unit m3
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B2	Concrete mix work		m3	10,707	10	107,070	
B3	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B3 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 132

Work Category Kerb Installation
 Code 20.50.012
 Work Item Name Kerbs

Description Provide lay and joint concrete class 20/20 kerbs in support to carriageway, bus bays and junctions

Unit m
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	5	9,875	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	14.6	10,454	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716			
B1	Base work		m3	242	2.7	653	
B2	Form work		m3	1,932	12	23,184	
B3	Concrete casting Class 15/20		m3	12,293	4	49,172	
22.79.107	Road Kerb		No.	488.4	112	54,701	No. of road kerb per 100m = 100/ (kerb length + mortar thickness) = 100/ (0.88+0.01) =112
22.79.108	Road channel		No.	296.5	112	33,208	No. of channel per 100m =100/ (channel length + mortar thickness) = 100/ (0.88+0.01) =112
	Subtotal					181,247	
	Miscellaneous Cost		%		5	9,062	% of Subtotal
	Total					190,309	
	Per unit					1,903	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B1 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	100 * 0.1 (10cm) * 1.2 (loss margin) =12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Tamper driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.67.005	Vibrator P/Tamper		Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2 (H=1.0m)

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100*1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 Concrete casting Class 15/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B4	Concrete mix work		m3	10,707	10	107,070	
B5	Concrete curing		m3	124	10	1,240	
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B5 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 133

Work Category Kilometre marker post Installation

Code 20.50.013

Work Item Name Kilometre marker posts

Description Kilometre marker post Installation.

Unit No.

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Steel plate Installation		100	5,636	100	563,600	
B2	Base work		m2	242	25	6,050	0.45 (foundation width) + 0.05 (margin) = 0.5 0.5 * 0.5 * 100 = 25
B3	Form work		m2	1,932	63	121,716	0.45 * 4 * 0.35 (depth) * 100 = 63
B4	Concrete casting class 15/20		m3	12,293	7.1	87,280	(0.45 * 0.45 * 0.35) * 100 = 7.09
	Total					778,646	
	Per unit					7,786	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.

B1 Steel plate instillation

Unit No.

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	4	7,900	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	4	5,668	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	8	5,728	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.77.107	Steel angle	125*5mm	kg	274.3	1383	379,357	(0.125 + 0.125 (Total width)) * 0.005(thickness) * 1.4 (length) * 7.9(density)* 100 = 1.383t
22.77.108	Steel plate	450*3mm	kg	105.4	480	50,592	(0.45 * 0.45 (area)) * 0.003(thickness) * 7.9(density) * 100 = 0.48t
22.79.105	White paint		litre	833	100	83,300	(steel angle: 0.125 * 4 * 1.4) + (steel plate: 0.45 * 0.33 * 2) * 0.001 (paint thickness) * 100 = 0.0997m3
22.79.106	Black paint		litre	838.9	5	4,195	White paint * 5% = 5
	Subtotal					536,739	
	Miscellaneous Cost		%		5	26,837	% of Subtotal
	Total					563,576	
	Per unit					5,636	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Base work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	100 * 0.1 (10cm) * 1.2 (loss margin) = 12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Tamper driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.005	Vibrator P/Tamper		Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B3 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100*1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B4 Concrete casting Class 15/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	10,707	10	107,070	
B6	Concrete curing		m3	124	10	1,240	Based on average productivity in Kenya
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 134

Work Category Bollard Installation
 Code 20.50.017
 Work Item Name Concrete bollards

Description Concrete bollard Installation (diameter 0.2m, length 0.9m, embedded depth 0.45m)

Unit No.
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	242	30	7,260	0.5 (foundation width) + 0.05 (margin) = 0.55, 0.55*0.55 * 100 = 30.25
B2	Form work		m2	1,932	50	96,600	(0.2*π*0.9: bollard + 0.5*4*0.45: foundation)*100=146.5; form work to be reused = set area to 50
B3	Concrete casting	Class 20/20	m3	13,752	2.8	38,506	for bollard (0.1*0.1*π*0.9)*100=2.8
B6	Concrete casting	Class 15/20	m3	12,293	10.3	126,618	for foundation (0.5*0.5*0.45 - 0.1*0.1*π*0.3) * 100 = 10.3
B9	Reinforcement	R10,R8	t	156,103	0.41	64,002	(0.85*6*0.56kg/m (for bollard) + 0.15*π*6*0.448kg/m (for foundation)) * 100 = 410kg
	Total					332,986	
	Per unit					3,330	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.

B1 Base work
 Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	100 * 0.1 (10cm) * 1.2 (loss margin) = 12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Tamper driving

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*6.8hp=1.03l
22.67.005	Vibrator P/Tamper	0	Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100*1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B3 Concrete placement Class 20/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.43	2,824	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1.98	2,806	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B4	Concrete mix work		m3	11,591	10	115,910	
B5	Concrete curing		m3	124	10	1,240	Based on average estimated productivity in Japan (see note)
	Subtotal					125,021	
	Miscellaneous Cost		%		10	12,502	% of Subtotal
	Total					137,523	
	Per unit					13,752	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B4 Concrete mix work

Unit m3
Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	319	4,402	290 * 1.1 (loss margin) = 319
22.69.009	Fine aggregates(sand)		m3	1793.6	0.46	825	0.42 * 1.1 (loss margin) = 0.462
22.70.002	Graded aggregates (ballast)		m3	1211.6	0.88	1,066	0.80*1.1 (loss margin) = 0.88
	Subtotal					11,591	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					11,591	
	Per unit					11,591	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B5 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete placement Class 15/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B7	Concrete mix work		m3	10,707	10	107,070	
B8	Concrete curing		m3	124	10	1,240	Based on average productivity in Kenya
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

2. The unit price does not include haulage cost.

3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)

- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B7 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B8 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B9 Reinforcement (below 16mm)

Unit ton

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.25	3,188	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.71.012	Square twisted bars 16mm		t	124344.2	1.1	136,779	1*1.1 (loss margin) = 1.1
	price adjustment		%		3	(4,103)	deduction to above 16mm price
	Subtotal					141,912	
	Miscellaneous Cost		%		10	14,191	
	Total					156,103	
	Per unit					156,103	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

2. The unit price does not include haulage cost.

3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)

- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 135

Work Category Bollard Installation
 Code 20.50.021
 Work Item Name Steel bollards

Description Place and provide gauge 16 steel pipe Bollards of diameter 150 mm and 1.05m above above the ground embedded to a depth of 0.45m at place

Unit No.
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Installation		No.	301	100	30,100	
B2	Base work		m2	242	16	3,872	Base width: 0.35(foundation width) + 0.05 (margin) = 0.4, 0.4 * 0.4 * 100 = 16.0
B3	Form work		m2	1,932	63	121,716	for foundation 0.35*4*0.45*100=63.0
B4	Concrete casting Class 15/20		m3	12,293	5.9	72,529	(0.35*0.35*0.45 (foundation) + 0.047*0.047 * π * 0.6 (in bollard above foundation))*100 = 5.9m3
	Total					228,217	
	Per unit					2,282	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.

B1 Installation

Unit No.
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.77.109	Steel bollard	SGP. 5B. 125A	kg	193.3	909	27,270	0.9*10.1*100=909kg
	Subtotal					28,702	
	Miscellaneous Cost		%		5	1,435	% of Subtotal
	Total					30,137	
	Per unit					301	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B2 Base work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	100 * 0.1 (10cm) * 1.2 (loss margin) =12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M1 Tamper driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan 0.151ℓ/hp*6.8hp=1.03ℓ
22.67.005	Vibrator P/Tamper	0	Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B3 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	120	168,000	100*1.2 (loss margin) = 120
	Subtotal					175,673	
	Miscellaneous Cost		%		10	17,567	% of Subtotal
	Total					193,240	
	Per unit					1,932	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B4 Concrete casting Class 15/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B5	Concrete mix work		m3	10,707	10	107,070	
B6	Concrete curing		m3	124	10	1,240	Based on average productivity in Kenya
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B5 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

No. 136

Work Category Reflective Stud Installation

Code 20.50.019

Work Item Name Reflective studs

Description Install reflective studs along the centre line

Unit No.

Quantity 120

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.9	1,778	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	7.2	5,155	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.012	Reflective 'cat' eyes		No	704.5	120	84,540	
	Subtotal					91,473	
	Miscellaneous Cost		%		5	4,574	% of Subtotal
	Total					96,046	
	Per unit					800	Total/Quantity

Note

- 1.The quantities are based on KRB: Activity No.2060003
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
- 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
- 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)
4. The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

No. 137

Work Category Microtunneling
 Code 20.60.002
 Work Item Name Microtunneling for a 150mm diameter PVC (polyvinyl chloride) duct

Description Conduct microtunneling with a 150mm dia PVC duct (under silt or sand condition)

Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Leading pipe jacking		m	4,514	10	45,140	
B2	Underground pipe jacking		m	7,851	10	78,510	
B3	Screw conveyor removal		m	1,109	10	11,085	
B4	Removal of surplus soil (temporary stock)		No.	147,036	1	147,036	
B5	Entrance of tunnel		No.	31,018	1	31,018	
B6	Entrance of exiting manhole		No.	28,476	1	28,476	
B7	Entrance wall cutting		No.	278	1	278	
B8	Jacking equipment installation		No.	84,682	1	84,682	
B9	Muddy water processing		No.	193,482	1	193,482	
22.79.109	Duct Pipe (PVC150)		m	483	11	5,310	10 * 1.1 (loss margin) = 11
	Subtotal					625,016	
	Miscellaneous Cost		%		10	62,502	% of Subtotal
	Total					687,518	
	Per unit					68,752	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 10%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 20%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

B1 Leading pipe jacking

Unit m
 Quantity 16

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.5	4,938	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.5	3,543	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M1	Truck driving (with crane)		Hour	5,045	5.3	26,739	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
M2	Equipment for leading pipe jacking 1		Day	31,986	1	31,986	
M3	Equipment for leading pipe jacking 2		Day	1,440	1	1,440	
	Subtotal					72,224	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					72,224	per 1day
	Per unit					4,514	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M1 Truck driving (with crane)

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05l/hp*179hp=8.95l
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M2 Equipment for lead pipe jacking 1

Per day

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.79.110	Equipment for lead pipe jacking		Day	31985.5	1	31,986	Based on average estimated productivity in Japan (see note)
	Total					31,986	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M3 Equipment for lead pipe jacking 2

Per day

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.79.111	Equipment for lead pipe jacking (fixing part)		Day	1332.8	1	1,333	
22.79.112	Equipment for lead pipe jacking (moving part)		m	106.7	1	107	
	Total					1,440	
	Per 1day					1,440	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Underground pipe jacking

Unit

m

Quantity

10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.5	4,938	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.5	3,543	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M4	Truck driving (with crane)		Hour	5,045	5.3	26,739	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
M5	Equipment for Underground pipe jacking 1		Day	18,658	1	18,658	
M6	Equipment for underground pipe jacking 2		Day	21,057	1	21,057	
	Subtotal					78,514	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					78,514	
	Per unit					7,851	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M4 Truck driving (with crane)

Per 1hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05l/hp*179hp=8.95l
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M5 Equipment for underground pipe jacking 1

Per 1day

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.79.113	Equipment for Underground pipe jacking		Day	18658.2	1	18,658	
	Total					18,658	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M6 Equipment for underground pipe jacking 2

Per 1day

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.79.114	Equipment for Underground pipe jacking (fixing part)		Day	12261.1	1	12,261	
22.79.115	Equipment for Underground pipe jacking (moving part)		m	8796	1	8,796	
	Total					21,057	
	Per 1day					21,057	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B3 Screw conveyor removal

Per 1m

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.5	4,938	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.5	3,543	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M7	Truck with crane driving		Hour	5,045	5.3	26,739	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
	Subtotal					38,799	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					38,799	
	Per 1m					1,109	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M7 Truck driving (with crane)

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05t/hp*179hp=8.95t
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B4 Removal of surplus soil (temporary stock)

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
M8	Power suction car driving		Day	49,012	3	147,036	Temporarily estimated quantity 10/16 (leading pipe jacking) + 10/10 (underground pipe jacking) + 10/35 (screw conveyor remove) + 1.0 (reserve) = 2.91
	Subtotal					147,036	
	Miscellaneous Cost		%		0	0	
	Total					147,036	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M8 Power suction car driving

Per day

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	7.2	991	
22.67.105	Power suction car	4t	Hour	6663.7	1	6,664	
	Miscellaneous Cost		%	0	0	0	
	Total					7,905	Per 1hour
	Per 1day					49,012	Per1hour * 6.2hour/day = Per 1day

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B5 Entrance of tunnel

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.5	4,938	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.5	3,543	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.116	Water stopper		No.	2,239	1	12,060	
M9	Truck with crane driving	4T,2.9tup	Hour	5,045	1.06	5,348	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
M10	Steel welding		m	464	1.7	788	Based on average estimated productivity in Japan (see note)
M11	Steel cutting		m	224	3.4	762	Based on average estimated productivity in Japan (see note)
	Subtotal					31,018	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					31,018	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M9 Truck driving (with crane)

Per 1hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05l/hp*179hp=8.95l
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M10 Steel welding

Per 1m

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.025	49	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.19	269	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.053	38	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					357	
	Miscellaneous Cost		%		0	107	% of Subtotal
	Total					464	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M11 Steel cuttings

Per 1m

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0.133	188	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.05	36	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					224	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					224	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Entrance of exiting manhole

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.5	4,938	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.5	3,543	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.116	Water stopper		No.	2239	1	12,060	
22.79.117	Concrete anchor		No.	269.5	8	2,156	
22.79.118	Water stop cement		Kg	200	11	2,200	
	Subtotal					28,476	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					28,476	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B7 Entrance wall cutting

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.018	36	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	0.143	203	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.055	39	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					278	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					278	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B8 Jacking equipment installation

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	5	9,875	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	10	14,170	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	10	7,160	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M12	Truck driving (with crane)		Hour	5,045	10.6	53,477	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
	Subtotal					84,682	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					84,682	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M12 Truck driving (with crane)

Per 1hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05l/hp*179hp=8.95l
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B9 Muddy water processing

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
M13	Muddy water processor Installation and removal		No.	19,399	1	19,399	
M15	Muddy water processing		No.	174,083	1	174,083	
	Subtotal					193,482	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					193,482	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M13 Muddy water processor Installation and removal

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	1.25	1,771	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	2.5	1,790	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M14	Truck driving (with crane)		Hour	5,045	2.65	13,369	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
	Total					19,399	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M14 Truck driving (with crane)

Per 1hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05l/hp*179hp=8.95l
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M15 Muddy water processing

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
M16	Muddy water processor Installation and removal		No.	19,399.3	1	19,399	
M18	Muddy water processing		No.	154,683.6	1	154,684	
	Total					174,083	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M16 Muddy water processor Installation and removal

Per a day

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.25	2,469	
22.50.005	Artisans G2		Person Day	1417	1.25	1,771	
22.50.002	Unskilled labour		Person Day	716	2.5	1,790	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
M17	Truck driving (with crane)		Hour	5,045	2.65	13,369	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
	Total					19,399	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M17 Truck driving (with crane)

Per 1hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05l/hp*179hp=8.95l
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M18 Muddy water processing

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
M19	Muddy water processing machine driving		Day	51,345	3	154,035	Based on average estimated productivity in Japan (see note)
M20	Muddy water aggregation		No.	649	1	649	
	Total					154,684	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

M19 Muddy water processing machine driving

Per day

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	0.235	168	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.67.106	Muddy water processing machine		Day	51176.7	1	51,177	
	Total					51,345	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M20 Muddy water aggregation

Per No.

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.79.119	Aggregation(jacking)		kg	9.6	67.5	648	Based on average estimated productivity in Japan (see note)
22.79.120	Aggregation(washing)		kg	9.6	0.07	1	Based on average estimated productivity in Japan (see note)
	Total					649	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 138

Work Category Microtunneling
 Code 20.60.002a
 Work Item Name Horizontal drilling

Description Conduct horizontal drilling for 150mm hole in diameter (under gravel condition)

Unit m (150mm)
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Drilling		m	14,249	10	142,490	
B2	Hole Magnification		m	22,352	10	223,520	
B3	Casing		m	1,858	10	18,580	
B4	Boring machine setting		No.	34,003	1	34,003	
	Total					418,593	
	Per unit					41,859	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.

B1 Drilling
 Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.5	4,938	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	5	7,085	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	7.4	5,298	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.121	Shank-rod	90mm	No.	283,604	0.05	14,180	Temporarily estimated quantity
22.79.122	Driving-adaptor		No.	1,514	0.04	61	Temporarily estimated quantity
22.79.123	drilling-pipe		No.	49,258	0.19	9,359	Temporarily estimated quantity
22.79.124	Ring-bit		No.	97,023	0.2	19,405	Temporarily estimated quantity
22.79.125	Water-swivel		No.	90,625	0.02	1,813	Temporarily estimated quantity
22.67.107	Boring machine	81kw	Day	53,333	0.99	52,800	
22.74.002	Fuel	Diesel	litre	137.7	106	14,596	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*110hp*6.45*0.99 = 106.06l
	Subtotal					129,534	
	Miscellaneous Cost		%		10	12,953	% of Subtotal
	Total					142,487	per 1day = 10m
	Per unit					14,249	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B2 Hole Magnification
 Unit m
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.5	4,938	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	5	7,085	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	7.4	5,298	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.126	Cutter-set		No.	44033.3	0.3	13,210	Temporarily estimated quantity
22.79.127	Core-tube		No.	44459.8	0.2	8,892	Temporarily estimated quantity
22.79.128	Magnifying-bit		No.	481913.9	0.2	96,383	Temporarily estimated quantity
22.67.107	Boring machine	81kw	Day	53333.4	0.99	52,800	
22.74.002	Fuel	Diesel	litre	137.7	106	14,596	Based on average fuel efficiency per horsepower in Japan 0.151l/hp*110hp*6.45*0.99 = 106.06l
	Subtotal					203,202	
	Miscellaneous Cost		%		10	20,320	% of Subtotal
	Total					223,522	per 1day = 10m
	Per unit					22,352	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 Casing
Unit m
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	2.5	4,938	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.5	3,543	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	5	3,580	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.109	Duct Pipe (PVC150)		m	482.7	10	4,827	
	Subtotal					16,887	
	Miscellaneous Cost		%		10	1,689	% of Subtotal
	Total					18,576	per 1day = 10m
	Per unit					1,858	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Boring machine setting

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Per No. Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1.5	2,963	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	3	4,251	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	3	2,148	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.78.101	Cypress	for fixed deck	m3	43426.9	0.18	7,817	
M1	Truck with crane driving		Hour	5,045	3.18	16,043	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
	Subtotal					33,221	
	Miscellaneous Cost		%		10	782	% of Subtotal
	Total					34,003	

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Truck driving (with crane)

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Per hour Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05l/hp*179hp=8.95l
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 139

Work Category Street light Installation
 Code 20.60.017
 Work Item Name Street lighting pole (7.6m)

Description Provide and install 7.6m street lighting pole including cables accessories and lamp.

Unit No.
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	242	10	2,420	Base width: $0.8 + 0.1 * 2 = 1.0$ $1.0 * 1.0 * 10 = 10$
B2	Form work		m2	854	32	27,328	1.0 (foundation height) * 0.8 (foundation width) * $4 * 10 = 32$
B3	Concrete placement Class 15/20		m3	12,293	6.4	78,675	$0.8 * 0.8 * 1.0 * 10 = 6.4$
B6	Lighting pole installation		No.	72,000	10	720,000	
	Total					828,423	
	Per unit					82,842	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. This unit price does not include haulage cost.
 3. The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	$100 * 0.1$ (10cm) * 1.2 (loss margin) = 12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Tamper driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{l}/\text{hp} * 6.8\text{hp} = 1.03\text{l}$
22.67.005	Vibrator P/Tamper	0	Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2

Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	50	70,000	100*1.2 (loss margin) = 120; form work to be reused = set area to 50
	Subtotal					77,673	
	Miscellaneous Cost		%		10	7,767	% of Subtotal
	Total					85,440	
	Per unit					854	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 Concrete placement Class 15/20

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B4	Concrete mix work		m3	10,707	10	107,070	
B5	Concrete curing		m3	124	10	1,240	Based on average productivity in Kenya
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete mix work

Unit m3

Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B5 Concrete curing

Unit m3

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Lighting pole installaion

Unit No.

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	10.25	14,524	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	17.25	12,351	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.129	Earth bar	10*1500m m	No.	550	10	5,500	Temporarily estimated quantity
22.79.130	Lighting pole	7.6m	No.	42213.4	10	422,134	Temporarily estimated quantity
22.79.132	Cable	for light	m	503.4	83	41,782	75 * 1.1 (loss margin) = 82.5
22.79.133	Accessories	for light	Set	3800	10	38,000	Temporarily estimated quantity
22.79.134	Lamp		No.	11066.7	10	110,667	Temporarily estimated quantity
M2	Truck driving (with crane)		Hour	5,045	1.9	9,586	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
	Subtotal					654,544	
	Miscellaneous Cost		%		10	65,454	% of Subtotal
	Total					719,998	
	Per unit					72,000	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M2 Truck driving (with crane)

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05t/hp*179hp=8.95t
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note

1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 140

Work Category Street light Installation
 Code 20.60.018
 Work Item Name Street lighting pole (10m)

Description Provide and install 10.0m street lighting pole including cables accessories and lamp.

Unit No.
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Base work		m2	242	10	2,420	Base width: $0.8 + 0.1 * 2 = 1.0$ $1.0 * 1.0 * 10 = 10$
B2	Form work		m2	854	60	51,240	1.5 (foundation height) * 0.8 (foundation width) * $4 * 10 = 48$
B3	Concrete placement Class 15/20		m3	12,293	9.6	118,013	$0.8 * 0.8 * 1.5 * 10 = 9.6$
B6	Lighting pole installation		No.	115,112	10	1,151,120	
	Total					1,322,793	
	Per unit					132,279	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. This unit price does not include haulage cost.
 - 3.The unit cost includes gravelling for base and concrete formwork but not excavating and filling.

B1 Base work

Unit m2
 Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	1	1,417	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	2	1,432	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
M1	Tamper driving		Hour	892	4.81	4,290	Based on average estimated productivity in Japan (see note)
22.72.021	Gravel material (murrum)		m3	1163.9	12	13,967	$100 * 0.1$ (10cm) * 1.2 (loss margin) = 12
	Subtotal					23,081	
	Miscellaneous Cost		%		5	1,154	% of Subtotal
	Total					24,235	
	Per unit					242	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M1 Tamper driving

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	1.03	142	Based on average fuel efficiency per horsepower in Japan $0.151\text{t}/\text{hp} * 6.8\text{hp} = 1.03\text{t}$
22.67.005	Vibrator P/Tamper	0	Hour	500	1	500	
	Miscellaneous Cost		%	0	0		
	Total					892	

- Note**
1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

B2 Form work

Unit m2
Quantity 100

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	1	1,975	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	2	2,834	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	4	2,864	Based on average productivity in Kenya
22.50.001	Support Staff		Person Day	716	0	0	
22.78.102	Wooden formwork panel		m2	1400	50	70,000	100*1.2 (loss margin) = 120; form work to be reused = set area to 50
	Subtotal					77,673	
	Miscellaneous Cost		%		10	7,767	% of Subtotal
	Total					85,440	
	Per unit					854	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B3 Concrete placement Class 15/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.25	494	Based on average productivity in Kenya
22.50.005	Artisans G2		Person Day	1417	0.5	709	Based on average productivity in Kenya
22.50.002	Unskilled labour		Person Day	716	3.13	2,241	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
B4	Concrete mix work		m3	10,707	10	107,070	
B5	Concrete curing		m3	124	10	1,240	Based on average productivity in Kenya
	Subtotal					111,753	
	Miscellaneous Cost		%		10	11,175	% of Subtotal
	Total					122,929	
	Per unit					12,293	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
 2. The unit price does not include haulage cost.
 3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

B4 Concrete mix work

Unit m3
Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	237	3,271	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.51	915	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.01	1,224	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,707	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,707	
	Per unit					10,707	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B5 Concrete curing

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

B6 Lighting pole installaion

Unit No.
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	10.25	14,524	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	17.25	12,351	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.129	Earth bar	10*1500m	No.	550	10	5,500	Temporarily estimated quantity
22.79.131	Lighting pole	10.0m	No.	80046.7	10	800,467	Temporarily estimated quantity
22.79.132	Cable	for light	m	503.4	110	55,374	100 * 1.1 (loss margin) = 110
22.79.133	Accessories	for light	Set	3800	10	38,000	Temporarily estimated quantity
22.79.134	Lamp		No.	11066.7	10	110,667	Temporarily estimated quantity
M2	Truck driving (with crane)		Hour	5,045	1.9	9,586	(for haulage within site and hoisting) Based on average estimated productivity in Japan (see note)
	Subtotal					1,046,469	
	Miscellaneous Cost		%		10	104,647	% of Subtotal
	Total					1,151,116	
	Per unit					115,112	Total/Quantity

Note 1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)

M2 Truck driving (with crane)

Per hour

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2000	0.125	250	1day = 8 hours 1hour = 0.125day
22.74.002	Fuel	Diesel	litre	137.7	8.95	1,232	Based on average fuel efficiency per horsepower in Japan 0.05l/hp*179hp=8.95l
22.61.102	Truck with crane	4t	Hour	3562.5	1	3,563	
	Miscellaneous Cost		%	0	0	0	
	Total					5,045	

Note 1. Quantities are based on Kenyan experiences and Japanese cost estimation manual.

No. 141

Work Category Street light Installation
 Code 20.60.016
 Work Item Name Street lighting control panel

Description Provide and install 10.0m street lighting pole including cables accessories and lamp.

Unit No.
 Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	13	18,421	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	8.75	6,265	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.79.135	Control panel		No.	34500	10	345,000	Temporarily estimated quantity
22.79.136	Cable	for control panel	m	1110	11	12,210	10 * 1.1 (loss margin) = 11
22.79.137	Accessories	for control panel	Set	34713.4	10	347,134	Temporarily estimated quantity
22.79.138	Meter		No.	3982.3	10	39,823	Temporarily estimated quantity
	Subtotal					768,853	
	Miscellaneous Cost		%		10	76,885	% of Subtotal
	Total					845,738	
	Per unit					84,574	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 142

Work Category Street light Installation

Code 20.60.315

Work Item Name Electric cable

Description Provide and install supply cables between the street lighting poles.

Unit m

Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0.63	893	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0	0	
22.50.001	Support Staff		Person Day	716	0	0	
22.79.136	Cable	for control panel	m	1110	11	12,210	10 * 1.1 (loss margin) = 11
	Subtotal					13,103	
	Miscellaneous Cost		%		10	1,310	% of Subtotal
	Total					14,413	
	Per unit					1,441	Total/Quantity

Note

1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)
2. The unit price does not include haulage cost.
3. Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 5%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 10%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

No. 143

Work Category Guardrail Repair
 Code 20.70.023a
 Work Item Name Guardrail Repair Level 1

Description Removal of damaged guardrail and replacement with straightened beam

Unit piece (4 m)
 Quantity 1

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Removal & Fixing & Realignment of posts		m	1,524	4.000	6,097	Based on average productivity in kenya
B2	Straightening of Beam		m	89	4.000	355	Based on average productivity in kenya
B3	Spacers Repair		No	708	2.000	1,416	Based on average productivity in kenya
	Total					7,868	
	Per unit					7,868	Total/Quantity

- Note**
1. 2ton truck is for hauling guardrail material and equipment and tool.
 2. Quantity for materials shall include the loss margin.
 3. No including the traffic control
 4. Miscellaneous Cost is for the equipment and tools of repair.

B1 Removal & Fixing & realignment of posts
 Unit m
 Quantity 4

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer	Supervisor	Person Day	1,975	0.108	212	Based on average productivity in kenya
22.50.005	Artisans G2		Person Day	1,417	0.245	347	Based on average productivity in kenya
22.50.002	Unskilled labour		Person Day	716	0.183	131	Based on average productivity in kenya
22.79.152	Bolts with nuts and washers (short)		No.	273	8	2,181	Based on average productivity in kenya
22.79.153	Bolts with nuts and washers (long)		No.	323	1	323	Based on average productivity in kenya
M1	Truck driving		Day	24,518	0.096	2,348	Based on average productivity in kenya
	Subtotal					5,542	
	Miscellaneous Cost		%	0	10	554	% of Subtotal
	Total					6,097	
	Per unit					1,524	Total/Quantity

M1 Truck driving

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.74.002	Fuel	Diesel	litre	138	5.32	733	Based on average fuel efficiency per horsepower in Japan 0.041l/hp*133hp=5.32l
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes		Hour	2,520	1	2,520	Based on average productivity in kenya
	Miscellaneous Cost		%	-	0		
	Total					3,503	

B2
Unit
Quantity

Beam Straightening
m
4

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer	Supervisor	Person Day	1,975	0.009	17	Based on average productivity in kenya
22.50.005	Artisans G2		Person Day	1,417	0.008	11	Based on average productivity in kenya
22.50.002	Unskilled labour		Person Day	716	0.016	11	Based on average productivity in kenya
M1	Beam Straightener		Day	80,079	0.004	283	Quotation rate
	Subtotal					323	
	Miscellaneous Cost		%	-	10	32	% of Subtotal
	Total					355	
	Per unit					89	Total/Quantity

M1 Beam Straightening

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.79.163	Electricity		Kw/h	24	22.00	528	Based on average productivity in kenya
22.79.164	Beam Straightener		Hour	10,662	1	10,662	Quotation rate
	Miscellaneous Cost		%	-	0		
	Total					11,440	

B3
Unit
Quantity

Spacer repair
No
1

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled labour: Overseer	Supervisor	Person Day	1,975	0.171	339	Based on average productivity in kenya
22.50.005	Artisans General		Person Day	1,417	0.171	243	Based on average productivity in kenya
22.50.002	Unskilled labour		Person Day	716	0.087	62	Based on average productivity in kenya
	Subtotal					644	
	Miscellaneous Cost		%	-	10	64	% of Subtotal
	Total					708	
	Per unit					708	Total/Quantity

Note: Miscellaneous costs include: Welding equipment, welding rods, anvil and 10kg hammer

No. 144

Work Category Guardrail Repair

Code 20.70.023a

Work Item Name Guardrail Repair Level 2

Description Removal of damaged guardrail, replacement with a straightened beam and realignment of posts

Unit piece (4 m)

Quantity 1

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
B1	Removal & Fixing & Realignment of post		m	1,698	4.000	6,792	Based on average productivity in kenya
B2	Straightening of Beam		m	89	4.000	355	Based on average productivity in kenya
B3	Spacers Repair		No	708	2.000	1,416	Based on average productivity in kenya
						8,563	
	Total					8,563	
	Per unit					8,563	Total/Quantity

- Note**
1. 2ton truck is for hauling guardrail material and equipment and tool.
 2. Quantity for materials shall include the loss margin.
 3. No including the traffic control
 4. Miscellaneous Cost is for the equipment and tools of repair.

B1 Removal & Fixing & realignment of posts

Unit m

Quantity 4

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer	Supervisor	Person Day	1,975	0.091	179	Based on average productivity in kenya
22.50.005	Artisans G2		Person Day	1,417	0.178	252	Based on average productivity in kenya
22.50.002	Unskilled labour		Person Day	716	0.278	199	Based on average productivity in kenya
22.79.152	Bolts with nuts and washers (short)		No.	273	8	2,181	Based on average productivity in kenya
22.79.153	Bolts with nuts and washers (long)		No.	323	1	323	Based on average productivity in kenya
M1	Truck driving		Day	24,518	0.096	2,348	Based on average productivity in kenya
M2	Concrete placing	Class 15/20	m3	10,819	0.064	692	Based on average productivity in kenya
	Subtotal					6,175	
	Miscellaneous Cost		%	0	10	617	% of Subtotal
	Total					6,792	
	Per unit					1,698	Total/Quantity

M1 Truck driving

Per hour

Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.101	Skilled Labour: Operator		Person Day	2,000	0.125	250	1day = 8 hours 1hour = 0.125 day
22.74.002	Fuel	Diesel	litre	138	5.32	733	Based on average fuel efficiency per horsepower in Japan 0.041l/hp*133hp=5.32l
22.61.101	Truck Flat bed : 2.5 - 5 Tonnes		Hour	2,520	1	2,520	Based on average productivity in kenya
	Miscellaneous Cost		%	-	0		
	Total					3,503	

M2 Concrete placement Class 15/20

Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
M3	Concrete mix work		m3	10,695	10	106,950	
M4	Concrete curing		m3	124	10	1,240	
	Subtotal					108,190	
	Miscellaneous Cost		%		0		% of Subtotal
	Total					108,190	
	Per unit					10,819	Total/Quantity

- Note**
- 1.The unit price does not include haulage cost.
 - 2.Miscellaneous cost is for general reusable equipment to execute the work. (e.g. hand tools, scaffoldings, safety gears)
 - 10%: clearing, cleaning, earthwork, base and surfacing works, simple street furniture works (e.g. marking, sign installation)
 - 20%: concrete works, structural works, complicated street furniture works (e.g. Microtunneling, street lamp works)

M3 Concrete mix work
Unit m3
Quantity 1

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0.75	1,481	Based on average estimated productivity in Japan (see note)
22.50.005	Artisans G2		Person Day	1417	2.38	3,372	Based on average estimated productivity in Japan (see note)
22.50.002	Unskilled labour		Person Day	716	0.62	444	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
22.70.004	Cement (ordinary portland)		Kg	13.8	236.5	3,264	215*1.1 (loss margin) = 236.5
22.69.009	Fine aggregates(sand)		m3	1793.6	0.506	908	0.46*1.1 (loss margin) = 0.506
22.70.002	Graded aggregates (ballast)		m3	1211.6	1.012	1,226	0.92*1.1 (loss margin) = 1.012
	Subtotal					10,695	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					10,695	
	Per unit					10,695	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

M4 Concrete curing
Unit m3
Quantity 10

Code	Name	Type	Unit	Unit price(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer		Person Day	1975	0	0	
22.50.005	Artisans G2		Person Day	1417	0	0	
22.50.002	Unskilled labour		Person Day	716	1.73	1,239	Based on average estimated productivity in Japan (see note)
22.50.001	Support Staff		Person Day	716	0	0	
	Subtotal					1,239	
	Miscellaneous Cost		%		0	0	% of Subtotal
	Total					1,239	
	Per unit					124	Total/Quantity

- Note**
1. Some of quantities which cannot be identified in Kenya refer to Japanese cost estimation manual with productivity conversion ratio(2.5 for labour and 1/0.7 for machinery) to African nations (JICA)

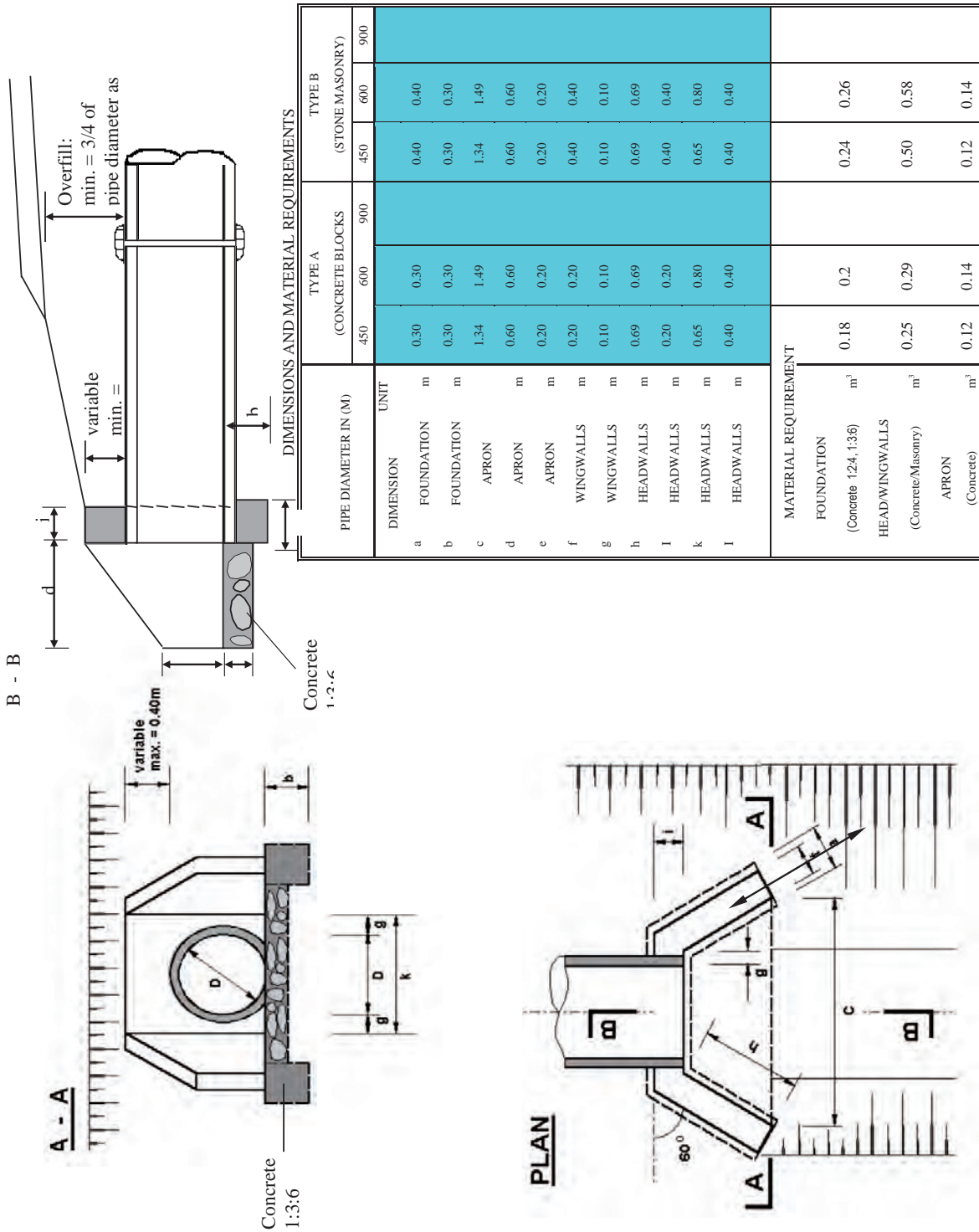
B2 Beam Straightening
Unit m
Quantity 4

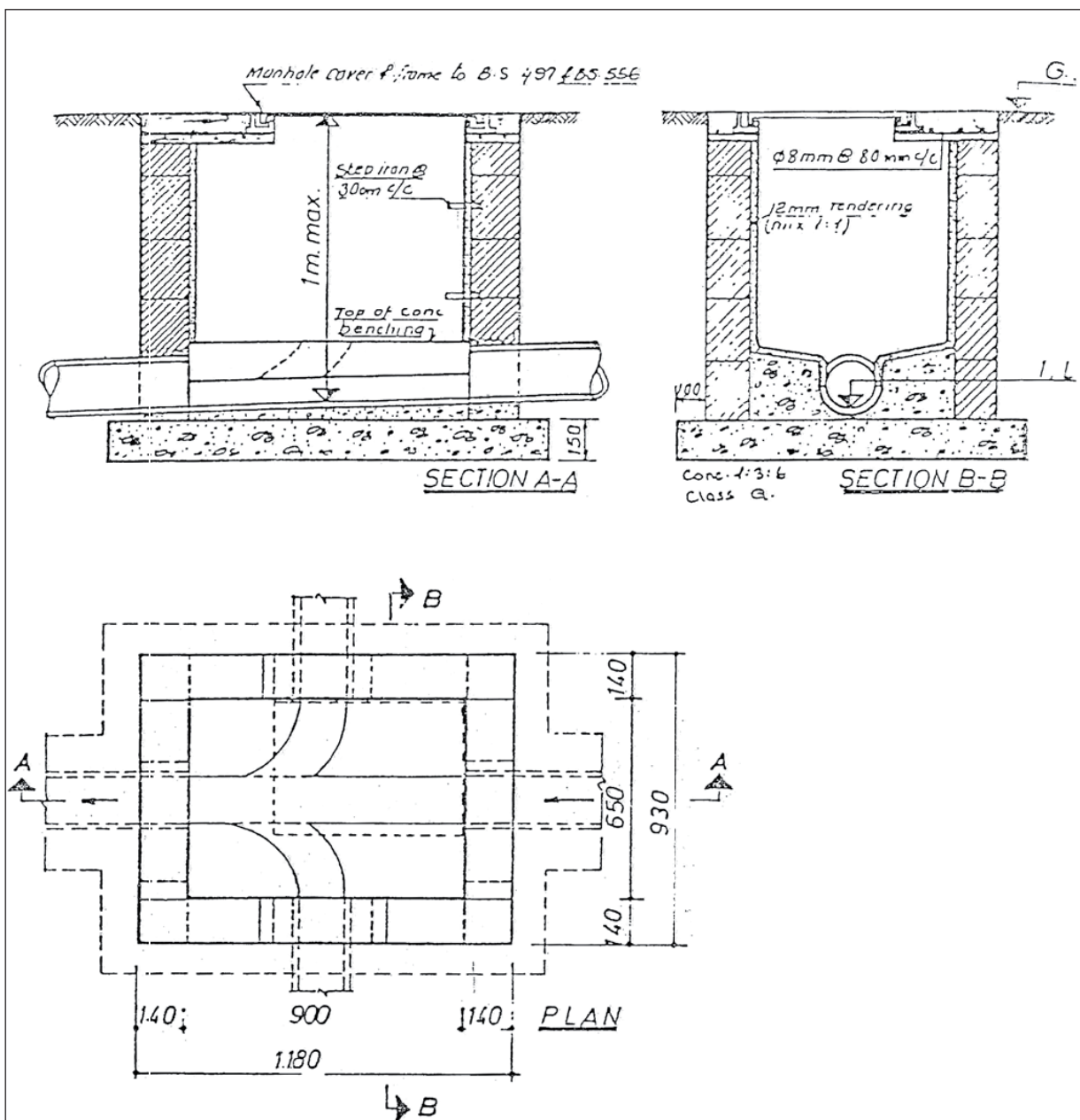
Code	Name	Type	Unit	Unit rate(Ksh)	Quantity	Sum (Ksh)	Remarks
22.50.007	Skilled Labour: Overseer	Supervisor	Person Day	1,975	0.009	17	Based on average productivity in kenya
22.50.005	Artisans G2		Person Day	1,417	0.008	11	Based on average productivity in kenya
22.50.002	Unskilled labour		Person Day	716	0.016	11	Based on average productivity in kenya
M1	Beam Straightening		day	80,079	0.004	283	Quotation rate
	Subtotal					323	
	Miscellaneous Cost		%	-	10	32	% of Subtotal
	Total					355	
	Per unit					89	Total/Quantity

Appendix 4 : Standard Drawings

Appendix 4: Standard Drawings

Figure C.12: Headwall Type 4 (for Access Culverts)



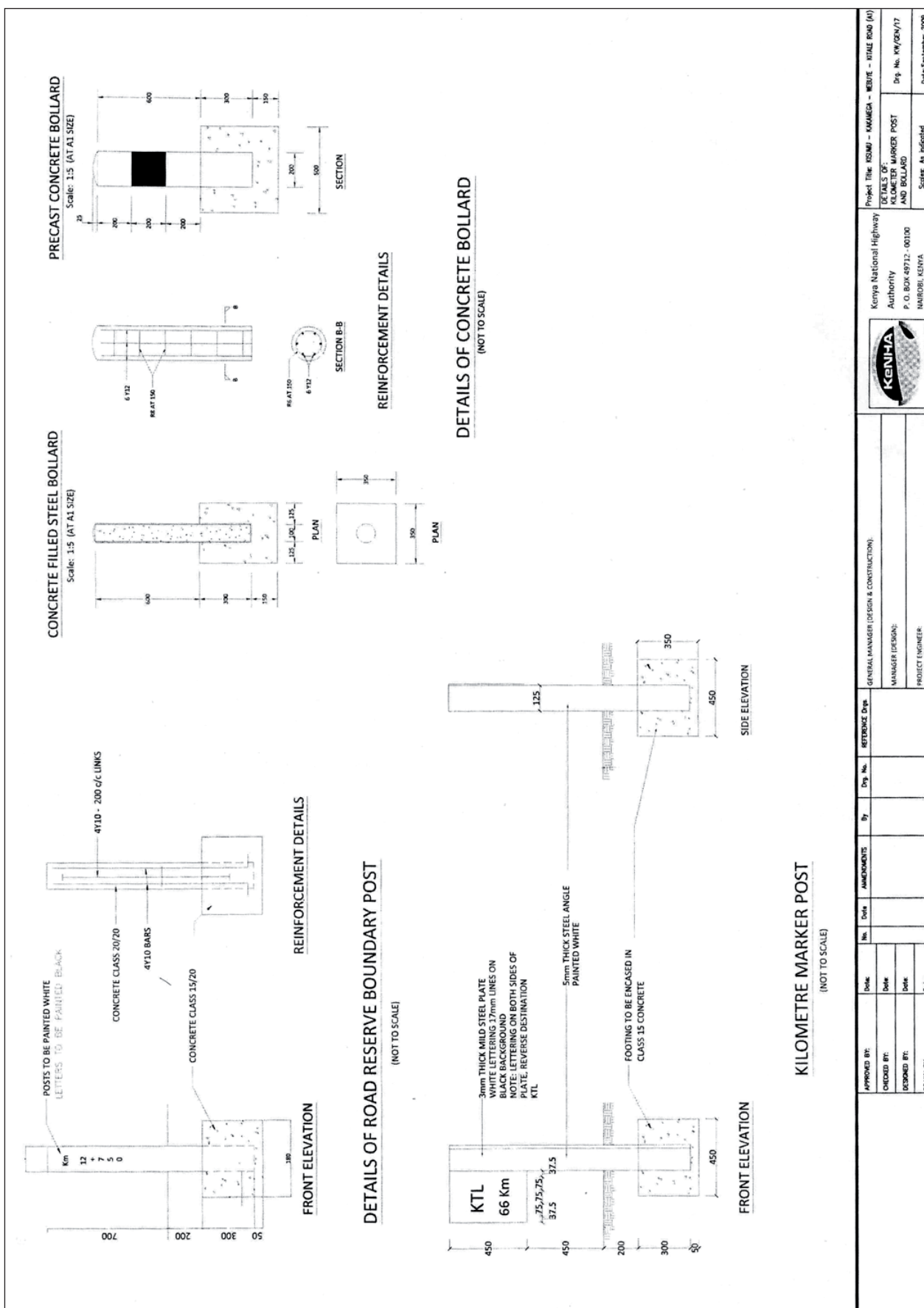


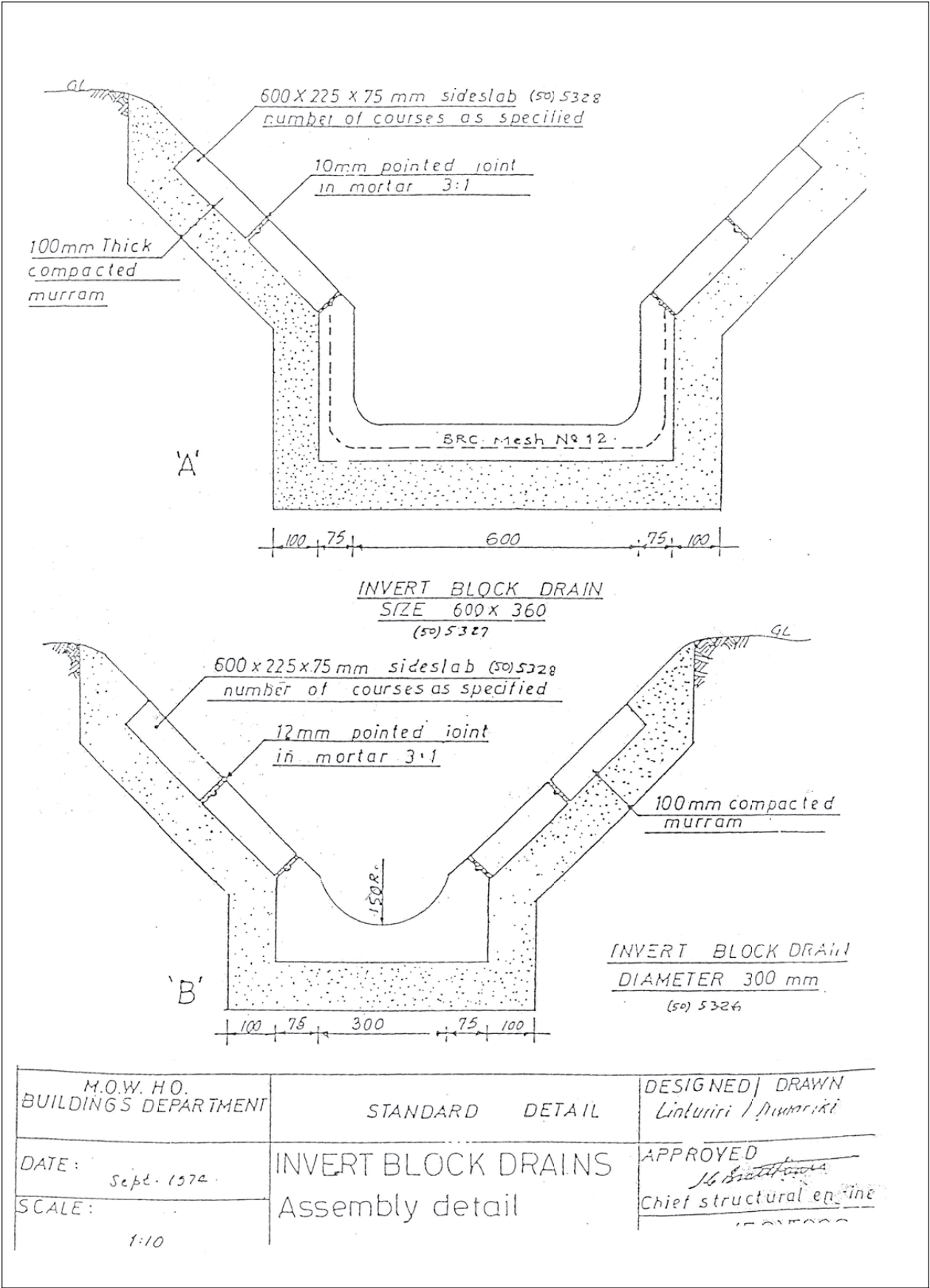
NOTES

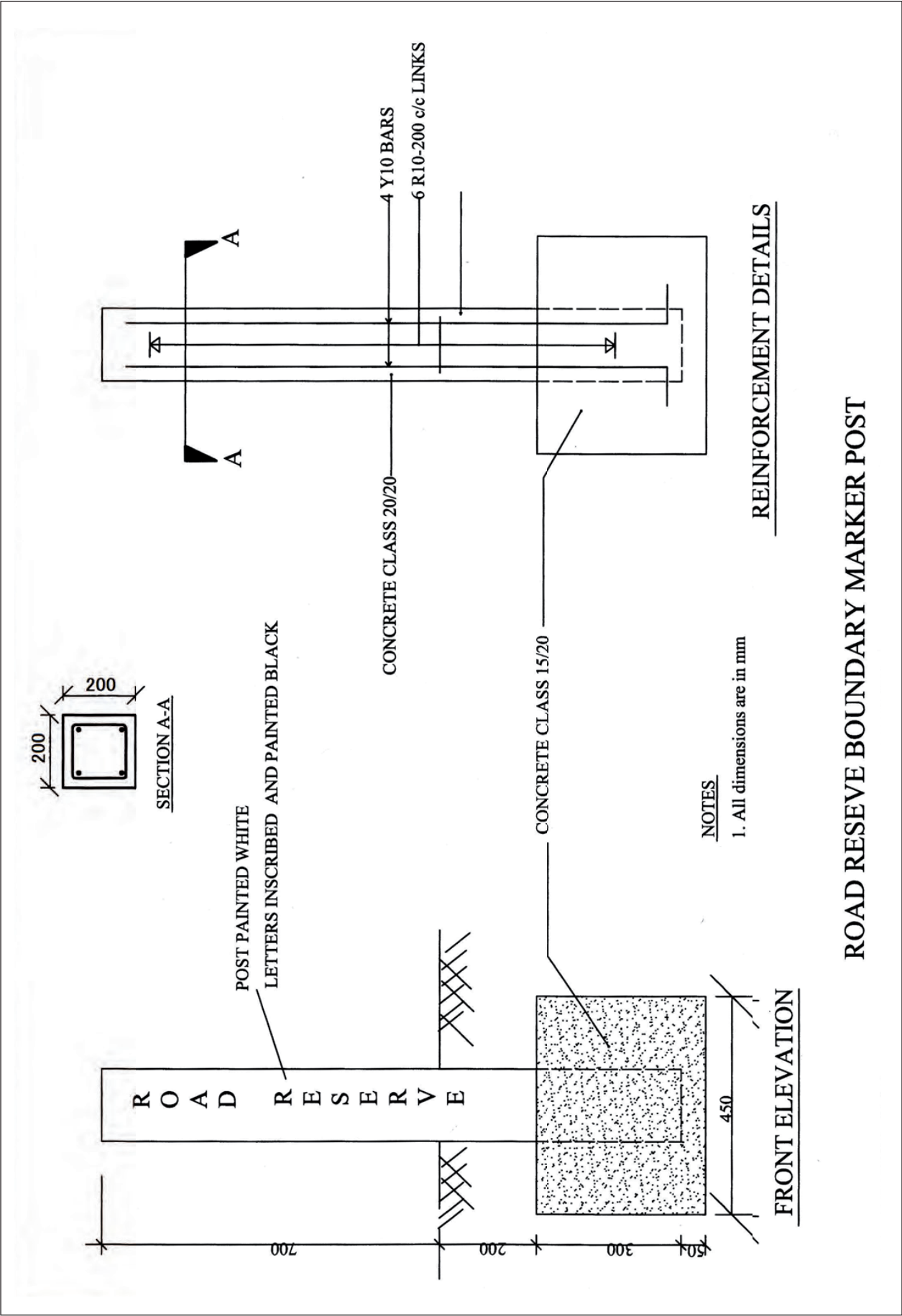
1. Side walls may be masonry or concrete blocks.
2. This manhole to be used where additional connections are required.

STANDARD DETAIL

RECTANGULAR
MANHOLE TYPE 'B'
(DEPTH 1m. max)







ROAD RESEVE BOUNDARY MARKER POST



Kenya Roads Board

3rd Floor Kenya Re Towers,
Off Ragati Rd, UpperHill
P.O. BOX 73718 - 00200,
NAIROBI, KENYA.

t: [+254] 20 4980 000 | 20 2722865/6/8

c: [+254] 733 334422 | 722 203418

e: info@krb.go.ke

www.krb.go.ke

