



KENYA URBAN ROADS AUTHORITY

Efficient & Safe Urban Roads

CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS

TENDER No.: KURA/DEV/HQ/301/2020-2021

BID DOCUMENT

1. FORM OF BID
2. APPENDIX TO FORM OF BID
3. STANDARD FORMS & SCHEDULES OF
SUPPLEMENTARY INFORMATION
4. INSTRUCTIONS TO BIDDERS
5. QUALIFICATION CRITERIA
6. CONDITIONS OF CONTRACT
7. STANDARD SPECIFICATIONS
8. SPECIAL SPECIFICATIONS
9. BILLS OF QUANTITIES
10. DRAWINGS

(CITIZEN CONTRACTORS)

FEBRUARY 2021

DIRECTOR (URD)

KENYA URBAN ROADS AUTHORITY

P.O. Box 41727 ~ 00100

NAIROBI.

DIRECTOR GENERAL

KENYA URBAN ROADS AUTHORITY

P.O. Box 41727 ~ 00100

NAIROBI.

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SECTION 1: FORM OF BID

FORM OF BID

(NOTE: The Appendix forms part of the Bid. Bidders are required to fill all the blank spaces in this form of Bid and Appendix)

NAME OF CONTRACT: CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS

TENDER No.: KURA/DEV/HQ/301/2020-2021

TO: The Director General
Kenya Urban Roads Authority
P. O. Box 41727 - 00100,
NAIROBI, KENYA

Sir,

Having examined the Conditions of Contract, Specifications, Bills of Quantities, and Drawings for the execution of the above named works we, the undersigned, offer to construct and install such works and remedy any defects therein in conformity with the said Bills of Quantities, Conditions of Contract, Specifications and Drawings for the sum of
(Insert amount in words)

.....
.....
.....
.....

(Insert amount in figures)

.....
.....
.....

as specified in the Appendix to Bid or such other sums as may be ascertained in accordance with the said Conditions.

We undertake, if our bid is accepted, to commence the works within twenty-eight (28) days of receipt of the Engineer's Order to Commence, and to complete and deliver the whole of the works comprised in the contract within the time stated in the Appendix to Form of Bid.

If our bid is accepted we will, when required, obtain the guarantee of a Bank or other sureties (to be approved by you) to be jointly and severally bound with us in a sum not exceeding 5% of the above named sum for the due performance of the contract under the terms of a Bond to be approved by you.

We agree to abide by this bid for the period of one hundred and twenty (120) days from the date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.

We understand that you are not bound to accept the lowest or any bid you may receive.

On the basis of our previous experience we are fully experienced and competent in the type of work included in this BID and we have adequate financial resources to carry out the works described within the period for completion. We are in a position to fulfil the contract for which we have Bided.

Dated this Day of 20

Signature:in the capacity of

Duly authorized to sign bids on behalf of (Name of Bidder)

.....

(Address of Bidder):

(Name of Witness):

(Signature of Witness):

(Address of Witness):

(Occupation of Witness):

SECTION 2: APPENDIX TO FORM OF BID

APPENDIX TO FORM OF BID
(This appendix forms part of the bid)

DESCRIPTION	Conditions of Contract Clause	DETAILS
Bid Security (Bank Guarantee Only)		Ksh. 500,000.00
Employer	1.1 (a) (i)	Director General Kenya Urban Roads Authority.
Engineer	1.1 (a) (iv)	Director (Urban Roads Development), Kenya Urban Roads Authority.
Engineer's Authority to Issue Variations	2.1(d)	25% of the Contract Price
Contract Documents	5.1 (a)	The language of the contract is English
	5.1 (b)	The law in force is that of the Republic of Kenya
Amount of Performance Security (Unconditional Bank Guarantee)	10.1	The performance security shall be in the form of an unconditional bank guarantee in the amount of Five (5) percent of the Contract Price
Access to Data	11.1	Data made available by the Employer under Sub clause 11.1 is open for inspection at the offices of the Director (Urban Roads Development), Kenya Urban Roads Authority, Nairobi.
Programme to be submitted	14.1	Not later than 21 (twenty one) days after issuance of Order to Commence
Cash Flow Estimate	14.3	Not later than 21 (twenty one) days after issuance of Order to Commence
Minimum Amount of Third Party Insurance	23.2	KShs. 10,000,000 (Kenya Shillings Ten Million only) per occurrence, with the number of occurrences unlimited.

Period for commencement, from Engineer's Order to Commence	41.1	Not later than 28 (Twenty Eight) days after Notice of Order to Commence
Time for Completion	43.1	Eighteen (18) Months + Twelve months (12) Defects Liability Period
Amount of Liquidated Damages	47.1	0.05% of the Contract Price per day
Limit of Liquidated Damages	47.1	10% (ten percent) of the Contract Price.
Taking over of Sections or Parts	48.2(a)	Applicable as per the Stipulation of Clause 107 of the Special Specifications.
Defects Liability Period	49.1	Twelve (12) Months
Advance Payment	60.12	The Employer MAY pay any amount up to a maximum of Ten percent (10%) of the Contract. Price subject to availability of funds
Minimum Amount of Interim Payment Certificates	60.2	Kshs. 20,000,000.00
Retention Money	60.2	10% (ten percent) of Interim Payment Certificates

CONDITIONS OF CONTRACT	CLAUSE	DETAILS
Limit of Retention Money	60.2	5 (five) percent of the Contract Price less Provisional Sums and Contingencies
Number of Copies of monthly Statement and statements of Completion and Final Statement	60.2 60.3 60.11 60.12	6 copies
Time within which payment to be made after Interim Payment Certificate signed by Engineer	60.4	90 days
Time within which payment to be made after Final Payment Certificate signed by the Engineer	60.4	90 days
Currency of Payment	60.6	Kenya Shillings only
Appointer of Arbitrator	67.3	The Chartered Institute of Arbitrators (Kenya)
Notice to Employer and Engineer	68.2	The Employer's address is: Director General Kenya Urban Roads Authority Barabara Plaza, Mazao road P.O. Box 41727 – 00100 <u>NAIROBI.</u> Tel. +254 020 8013844 Email: info@kura.go.ke Web: www.kura.go.ke The Engineer's address is: Director (Urban Roads Development) Kenya Urban Roads Authority Barabara Plaza, Mazao Road P.O. Box 41727 – 00100

		<u>NAIROBI.</u> Tel. +254 020 8013844 Email: info@kura.go.ke Web: www.kura.go.ke
Constant for Price Adjustment Formula	70.3	8% (Eight percent)
Source of Indices	70.4	Kenya National Bureau of Statistics
Approximate Weightings for Price Adjustment Formula	70.770.3,	See Table A below
Weightings and Indices	70.4 and 70.5	Where necessary, in the table B below, bidders shall (a) indicate their amounts of local currency payment, (b) indicate their proposed source and base values of indices for the different foreign currency elements of cost, (c) derive their proposed weightings for local and foreign currency payment as indicated in table B below, and (d) list the exchange rates used in the currency conversion

Table A **Approximate Weightings for Price Adjustment**

<i>Description of Index</i>	<i>% Range of Weighting</i>
Fixed ("A")	8
Labour	8 – 12
Fuels and Lubricants	12 – 22
Equipment and Spares	20 – 30
Cement	8 – 12
Reinforcement and Steel products	1 – 3
Explosives	1 – 5
Bitumen and Bituminous products	15 – 25
Total	100

NOTE: ^a Denotes that this should be used as guidance to bidders and for purpose of checking their submissions, the Employer has estimated and provided a range of acceptable weightings for related major construction inputs in accordance with the potential range of construction methodologies, based on estimated cost in a common currency.

Table B: Bidder's proposed weighting

<i>Index Code</i>	<i>Index Description</i>	<i>Source of Index</i>	<i>Base value and date</i>		<i>Bidder's proposed weighting</i>
	Non adjustable	Civil Engineering Cost Indices from Kenya National Bureau of Statistics. For equipment & spares, the official indices from source country shall apply	The Indices prevailing at 28 days before tender submission deadline shall apply		A: 0.08 b: _____ c: _____ d: _____ e: _____
			Total		1.00

Signature of Bidder.....

Date

SECTION 3: STANDARD FORMS AND SCHEDULES OF SUPPLEMENTARY INFORMATION

STANDARD FORMS & SCHEDULES OF SUPPLEMENTARY INFORMATION

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STANDARD FORMS

3.1 BANK GUARANTEE FOR ADVANCE PAYMENT

To: **Director General,**
Kenya Urban Roads Authority,
Barabara Plaza, Mazao Road
P.O. Box 41727 - 00100
NAIROBI

_____ (Date)

Gentlemen,

Ref: **CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS**

TENDER No.: KURA/DEV/HQ/301/2020-2021

In accordance with the provisions of the Conditions of Contract of the above-mentioned Contract, We, _____ *[name and Address of Contractor]* (hereinafter called “the Contractor”) shall deposit with _____ *[name of Employer]* a bank guarantee to guarantee his proper and faithful performance under the said Contract in an amount of KShs. _____ *[amount of Guarantee in figures]* Kenya Shillings _____ *[amount of Guarantee in words]*.

We, _____ *[bank or financial institution]*, as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to _____ *[name of Employer]* on his first demand without whatsoever right of objection on our part and without his first claim to the Contractor, in the amount not exceeding Kshs _____ *[amount of Guarantee in figures]* Kenya Shillings _____ *[amount of Guarantee in words]*, such amount to be reduced periodically by the amounts recovered by you from the proceeds of the Contract.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract

documents which may be made between _____ [*name of Employer*] and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

No drawing may be made by you under this guarantee until we have received notice in writing from you that an advance payment of the amount listed above has been paid to the Contractor pursuant to the Contract.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until

_____ (*name of Employer*) receives full payment of the same amount from the Contract.

Yours faithfully,

Signature and Seal _____

Name of the Bank or financial institution _____

Address _____

Date _____

Witness: Name: _____

Address: _____

Signature: _____

Date: _____

3.2 FORM OF BANK BID SECURITY

Note: The bidder shall complete only this Form of Bank guarantee. No other Form of Bid Bond or any other forms of security will be accepted. Bidders who fail to comply with this requirement will be disqualified.

WHEREAS [Name of bidder]

.....

.....

(herein after called “the Bidder”) has submitted his bid dated

for the **CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS**

TENDER No.: KURA/DEV/HQ/301/2020-2021

Herein after called “the bid”

KNOW ALL MEN by these presents that we [Name of Bank]

.....

.....

of [Name of Country]

.....

having our registered offices at

.....

(Hereinafter called the Bank) are bound unto the Director General, Kenya Urban Roads Authority (hereinafter called “The Employer”) in the sum of

(in words KShs)

.....

.....

.....

(In figures KShs).....

for which payment will be well and truly made to the said Employer the Bank binds itself, its successors and assigns by these presents.

Signed for the said Bank thisday of20.....

THE CONDITIONS of this obligation are:

1. If the bidder withdraws his Bid during the period of bid validity specified by the Bidder on the Bid Form; or
2. If the Bidder refuses to accept the correction of errors in his bid; or
3. If the Bidder having been notified of the acceptance of his bid by the Employer during the period of Bid Validity
 - (i) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders when required or
 - (ii) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders.

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of any of the above conditions, specifying the occurred condition or conditions. This guarantee will remain in force up to and including thirty (30) days after the date of expiration of the bid validity, as stated in the Instructions to Bidders.

At the request of the Employer the Bid validity period may be extended by mutual agreement between the Employer and the Bidder and we undertake to extend the validity of this surety accordingly without you having to inform us of such an extension of the Bid validity period if within this period the Bidder has been notified of the acceptance of his Bid. This Surety shall remain valid up to the time the Contract Agreement has been executed.

AUTHORIZED SIGNATURE OF THE BANK

.....

NAME OF SIGNATORY

.....

DATE.....

TITLE OF SIGNATORY

NAME OF THE WITNESS

SIGNATURE OF THE WITNESS DATE

ADDRESS OF THE WITNESS

3.3 FORM OF INVITATION FOR BIDS

_____ [date]

To: _____ [name of Contractor]
_____ [address]

Dear Sirs:

Ref: **CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS**
TENDER No.: KURA/DEV/HQ/301/2020-2021

You have been invited to bid for the above project.

We hereby invite you and other bidders to submit a bid for the execution and completion of the above Contract.

A complete set of bid documents may be purchased by you from: **Kenya Urban Roads Authority, P.O. Box 41727 – 00100, Nairobi, Kenya, 5th Ngong Avenue, Barabara Plaza, Tel. No. 254-020-8013844, email: info@kura.go.ke, Web: www.kura.go.ke**

Upon payment of a non-refundable fee of Kshs. 1,000/- (Kenya Shillings: One thousand only)

All bids must be accompanied by three (3) number of copies of the same and a security in the form and amount specified in the bidding documents, and must be delivered to **The Director General, Kenya Urban Roads Authority, P.O. Box 41727 – 00100, Nairobi, Kenya, Barabara Plaza, Tel. No. 254-020-8013844, email: info@kura.go.ke Web: www.kura.go.ke** on or before 10:00 am. on Bids will be opened immediately thereafter, in the presence of bidders' representatives who choose to attend.

Please confirm receipt of this letter immediately in writing by cable/facsimile or telex.

Yours faithfully,

_____ (Authorised Signature)

_____ (Name and Title)

3.4 LETTER OF ACCEPTANCE

[Letter head paper of the Employer]

_____ *[date]*

To: _____ *[name of the Contractor]*

_____ *[address of the Contractor]*

Dear Sir,

This is to notify you that your Bid dated _____ for the execution of **CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS**

TENDER No.: KURA/DEV/HQ/301/2020-2021

for the Contract Price of Kshs. _____ *[amount in figures/ Kenya Shillings* _____ *(amount in words) in* accordance with the Instructions to Bidders is hereby accepted.

You are hereby instructed to proceed with the execution of the said Works in accordance with the Contract documents.

Authorized Signature

.....

Name and Title of Signatory

.....

Attachment: Agreement

3.5 FORM OF AGREEMENT

THIS AGREEMENT, made the _____ day of _____ 20____ between the **Director General, Kenya Urban Roads Authority, Barabara Plaza, Nairobi** (hereinafter called “the Employer”) of the one part AND

_____ of [or whose registered office is situated at] _____
(Hereinafter called “the Contractor”) of the other part.

WHEREAS THE Employer is desirous that the Contractor **CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS**

TENDER No...: KURA/DEV/HQ/301/2020-2021

(hereinafter called “the Works”) located in Nairobi county and the Employer has accepted the bid submitted by the Contractor for the execution and completion of such Works and the remedying of any defects therein for the Contract Price of Kshs. _____ [*Amount in figures*], Kenya Shillings _____ [*Amount in words*].

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and shall be read and construed as part of this Agreement:
 - (i) Letter of Acceptance
 - (ii) Form of Bid and Appendix to Form of Bid
 - (iii) Conditions of Contract, Part I
 - (iv) Conditions of Contract, Part II
 - (v) Specifications
 - (vi) Drawings
 - (vii) Priced Bill of Quantities

All aforesaid documents are hereinafter referred to as "The Contract".

3. In consideration of the payment to be made by the Employer to the Contractor, the Contractor hereby covenants with the Employer to execute, complete and maintain the works in conformity in all respects with the provisions of the Contract.
4. The Employer hereby covenants to pay the Contractor in consideration of the execution, completion and maintenance of the works the Contract Price at the times and in the manner prescribed by the Contract.

IN WITNESS WHEREOF the parties hereto have caused their respective common seals to be hereto affixed (or have hereunto set their respective hands and seals) on the day and year first above written.

SIGNED AND DELIVERED

By the said Employer:
(Director General, Kenya Urban Roads Authority)
For and on behalf of the said Employer.

In the presence of:
(Name and Designation of Witness)

.....
(Signature of Witness)

.....
(Address of witness)

By the said Contractor:

In the presence of:
(Name and Designation of Witness)

.....
(Signature of Witness)

.....
(Address of witness)

3.6 PERFORMANCE BANK GUARANTEE (UNCONDITIONAL)

To: Director General
Kenya Urban Roads Authority
P.O. Box 41727 - 00100
NAIROBI

Dear Sir,

WHEREAS _____ (hereinafter called “the Contractor”) has undertaken, in pursuance of Contract No. **RD.** dated _____ to execute **CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS**

TENDER No...: KURA/DEV/HQ/301/2020-2021

(hereinafter called “the Works”);

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognised bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Kshs. _____ (*amount of Guarantee in figures*) Kenya Shillings _____

_____ (*amount of Guarantee in words*), and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of Kenya Shillings _____

_____ (*amount of Guarantee in words*) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change, addition or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this Guarantee, and we hereby waive notice of any change, addition, or modification.

This guarantee shall be valid until the date of issue of the Certificate of Completion.

SIGNATURE AND SEAL OF THE GUARANTOR _____

Name of Bank: _____

Address: _____

Date: _____

SCHEDULE OF SUPPLEMENTARY INFORMATION

3.7 BID QUESTIONNAIRE

Please fill in block letters.

1. Full names of Bidder.....
.....
 2. Full address of Bidder to which Bid correspondence is to be sent (unless an agent has been appointed below).....
.....
 3. Telephone number (s) of Bidder
.....
 4. Telex address Bidder
.....
 5. Name of Bidder's representative to be contacted on matters of the Bid during the Bid period
.....
 6. Details of Bidder's nominated agent (if any) to receive Bid notices. This is essential if the Bidder does not have his registered address in Kenya (name, address, telephone, telex)
.....
.....
.....
- Signature of Bidder.....

3.8 CONFIDENTIAL BUSINESS QUESTIONNAIRE

You are requested to give the particulars indicated in Part 1 and either Part 2 (a), 2 (b) or 2 (c) and 2 (d) whichever applies to your type of business.

You are advised that it is a serious offence to give false information on this Form.

Part 1 – General:

Business Name:

.....

Location of business premises:Country/Town.....

Plot No.....Street/Road

Postal Address..... Tel No.....

Nature of

Business.....

Current Trade Licence No..... Expiring
date.....

Maximum value of business which you can handle at any time: Kshs.

.....

Name of your

bankers.....

Branch.....

...

Part 2 (a) – Sole Proprietor:

Your name in full.....

Age.....

Nationality..... Country of

Origin.....

*Citizenship details

.....

Part 2 (b) – Partnership:*Give details of partners as follows:*

	<u><i>Name in full</i></u>	<u><i>Nationality</i></u>	<u><i>Citizenship Details</i></u>	<u><i>Shares</i></u>
1				
2				
3				

Part 2(c) – Registered Company:

Private or public.....

State the nominal and issued capital of the Company

Nominal Kshs.....

Issued Kshs.....

Give details of all directors as follows:

	<u><i>Name in full</i></u>	<u><i>Nationality</i></u>	<u><i>Citizenship Details</i></u>	<u><i>Shares</i></u>
1				
2				
3				
4				

Part 2(d) – Interest in the Firm:

Is there any person/persons in **Kenya Urban Roads Authority** who has interest in this firm?

Yes/No..... (*Delete as necessary*)

I certify that the information given above is correct.

.....

(Title)

.....

(Signature)

.....

(Date)

** Attach proof of citizenship.*

3.9 SCHEDULE OF MATERIALS BASIC PRICES**(Ref: Clause 70 of Conditions of Contract)**

Item No.	Description	Country of Origin	Name of Supplier	unit	Transportation Cost from Source/Origin	
					Mode	Price(Kshs)
1.	Cut-back Bitumen MC 30 in bulk			Litre		
2.	Cut-back Bitumen MC 30 in drums			Litre		
3.	Bitumen 80/100 in bulk			Kg		
4.	Bitumen 80/100 in drums			Kg		
5.	Bitumen Emulsion K1 -60 in bulk			Litre		
6.	Bitumen Emulsion K1 -60 in drums			Litre		
7.	Cut-back Bitumen MC 70 in bulk			Litre		
8.	Cut-back Bitumen MC 70 in drums			Litre		
9.	Petrol, Regular Grade			Litre		
10.	Petrol, Premium/ super Grade			Litre		
11.	Automotive Diesel Fuel			Litre		
12.	Industrial Diesel Oil			Litre		
13.	Kerosene Fuel			Litre		
14.	Cement			Tonne		
15.	Flex beam Guardrail			Metre		
16.	Gabion Mesh			M ²		
17.	Reinforcing Steel			Tonne		
18.	Lime			Tonne		

I certify that the above information is correct.

.....

.....

.....

*(Title)**(Signature)**(Date)*

The prices inserted above shall be those prevailing 28 days before the submission of Bids and shall be quoted in Kenya Shillings using the exchange rates specified in the Appendix to Form of Bid.

Prices of imported materials to be quoted CIF Mombasa or Nairobi, as appropriate, depending on whether materials are imported by the Bidder directly or through a local agent.

Transportation costs for imported materials to be quoted from Mombasa or Nairobi as appropriate to mid-point of **CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS**

TENDER No: KURA/DEV/HQ/301/2020-2021

depending on whether materials are imported directly by the Bidder or through a local agent.

3.10 MAJOR ITEMS OF CONSTRUCTION PLANT AND EQUIPMENT

Description Type, Model, Make	No. of each	Year of Manufacture	New or Used	Capacity t or m ³	Estimated CIF Mombasa Value (If to be Imported)	Source	Owned/ Leased/ Imported	Power Rating	Date of Arrival on Project (Days after commence

The Bidder shall enter in this schedule all major items of plant and equipment which he proposes to bring to site. Only reliable plant in good working order and suitable for the work required of it shall be shown on this Schedule. Summary of the same shall be entered in Section 5: Qualification Criteria, Part 7.

I certify that the above information is correct.

.....

(Title)

.....

(Signature)

.....

(Date)

3.11 SCHEDULE OF LABOUR BASIC RATES

(Reference: Clause 70 of Conditions of Contract)

LABOUR CATEGORY	(MONTH/SHIFT/HOUR)	RATES

Categories to be generally in accordance with those used by the Kenya Building Construction and Engineering and Allied Trades Workers' Union.

.....

(Title)

.....

(Signature)

.....

(Date)

3.12 DETAILS OF SUBCONTRACTORS

If the Bidder wishes to sublet any portions of the Works under any heading, he must give below details of the subcontractors he intends to employ for each portion.

Failure to comply with this requirement may invalidate the bid.

(1) Portion of Works to be sublet:

(i) Full name of Subcontractor and address of head office:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

(ii) Subcontractor's experience of similar works carried out in the last 3 years with contract value:

	<u>Similar Works</u>	<u>Contract Value</u>
1		
2		
3		

(2) Portion of Works to sublet:

.....

(i) Full name of sub-contractor and address of head office:

.....
.....

.....

(ii) Sub-contractor's experience of similar works carried out in the last 3 years with contract value:

<u>Similar Works</u> <u>Value</u>	<u>Contract</u>
1	
2	
3.....	
..... [Signature of Bidder]	 (Date)

3.13 CERTIFICATE OF BIDDER'S VISIT TO SITE

This is to certify that

[Name/s]

.....

Being the authorized representative/Agent of [Name of bidder]

.....

.....

Has familiarized himself/herself with the scope of works and Site conditions in accordance with the Instructions to bidders and the Tender Notice for purposes of bidding for this road project.

CONSTRUCTION OF RUAI (HOUSING PROJECT) ROADS

TENDER NO: KURA/DEV/HQ/301/2020-2021

Having studied the Tender Documents, and gained knowledge of local conditions on site likely to influence the Works and Cost thereof, I certify that I am satisfied with the description of the Works and understand the scope of Works as specified and as implied in this tender.

Onday of.....20.....

.....

.....

(SIGNED, STAMPED & DATED BY AUTHORIZED BIDDERS AGENT/ REPRESENTATIVE)
(DESIGNATION)

3.14 FORM OF WRITTEN POWER OF ATTORNEY

The Bidder shall state here below the name(s) and address of his representative(s) who is/are authorized to receive on his behalf correspondence in connection with the Bid.

(The Bidder consisting of a joint venture shall state here below the name and address of his representative who is authorised to receive on his behalf correspondence in connection with the Bid.)

.....

(Name of Bidder's Representative in block letters)

.....

(Address of Bidder's Representative)

.....

(Signature of Bidder's Representative)

Alternate:

.....

(Name of Bidder's Representative in block letters)

.....

(Address of Bidder's Representative)

.....

(Signature of Bidder's Representative)

*To be filled by all Bidders.

3.15 KEY PERSONNEL

DESIGNATION	NAME	NATIONALITY	SUMMARY OF QUALIFICATIONS AND EXPERIENCE
Headquarters: 1. Director 2. 3. 4. 5. Etc.			
Site Office: 1. Site Superintendent 2. 3. 4. 5. etc.			

I certify that the above information is correct.

.....
(Title)

.....
(Signature)

.....
(Date)

3.16 SCHEDULE OF COMPLETED CIVIL WORKS CARRIED OUT BY THE BIDDER IN THE LAST FIVE YEARS

DESCRIPTION OF WORKS AND CLIENT	TOTAL VALUE OF WORKS (KSHS)*	CONTRACT PERIOD (YEARS)	YEAR COMPLETED
A. <u>Non-completed Works</u>			
B. <u>Completed Works</u>			
C. <u>Specific Construction Experience</u>			

--	--	--	--

I certify that the above Civil Works were successfully carried out and completed by ourselves.

.....

(Title)

.....

(Signature)

.....

(Date)

*Value in Kshs. using Central Bank of Kenya mean exchange rate at a reference date 28 days before the date of bid opening.

3.17 SCHEDULE OF PROJECTS CURRENTLY IN PROGRESS

DESCRIPTION OF WORK AND CLIENT	CONTRACT PERIOD	DATE OF COMMENCE- MENT	DATE OF COMPLETION	TOTAL VALUE OF WORKS (KSHS.)	PERCENTAGE COMPLETED TO DATE

I certify that the above Civil Works are being carried out by ourselves and that the above information is correct.

.....

.....

.....

(Title)

(Signature)

(Date)

3.18 FINANCIAL STANDING

- 1 Submit copies of audited profit and loss statements and balance sheet for the last five calendar years and estimated projection for the next two years with certified English translation where appropriate.
- 2 Give turnover figures for each of the last five (5) financial years. Quote in millions and decimal thereof.

	Year	Year	Year	Year	Year
	KShs.	KShs.	KShs.	KShs.	KShs.
Road works					
Other civil Engineering works					
Other (specify)					
Total					

SUMMARY OF ASSETS AND LIABILITIES OF THE AUDITED FINANCIAL STATEMENTS OF THE LAST THREE (3) FINANCIAL YEARS.

	Year	Year	Year
	KShs.	KShs.	KShs.
1. Total Assets			
2. Current Assets			
3. Bank Credit Line Value			
4. Total Liabilities			
5. Current Liabilities			
6. Net Worth (1-4)			
7. Working capital (2+3-4)			

- (a) Name/Address of Commercial Bank providing credit line

.....

.....

- (b) Total amount of credit line KShs.....

Attach certified copies of financial bank statements of the last six (6) months.

Attach a certified copy of Undertaking of the Bank to providing the credit.

3.19 OTHER SUPPLEMENTARY INFORMATION

1. Financial reports for the last five years, balance sheets, profit and loss statements, auditors' reports etc. List them below and attach copies.

.....
...
.....
...
.....
...
.....
...
.....
...
.....
...

2. Evidence of access to financial resources to meet the qualification requirements. Cash in hand, lines of credit etc. List below and attach copies of supporting documents

.....
...
.....
...
.....
...
.....
...
.....
...
.....
...

3. Name, address, telephone, telex, fax numbers of the Bidder's Bankers who may provide reference if contacted by the Employer.

.....
...

.....
 ...

 ...

 ...

 ...

4. Information on current litigation in which the Bidder is involved.

OTHER PARTY (IES)	CAUSE OF DISPUTE	AMOUNT INVOLVED (KSHS)

I certify that the above information is correct.

.....
(Title)

.....
(Signature)

.....
(Date)

3.20 DECLARATION FORM

Date:

To: Director General
Kenya Urban Roads Authority
P.O. Box 41727 - 00100
NAIROBI

The Bidder (name and address)

.....
.....
...
.....
...
.....
...
.....
...

Declares the following:

- (a) Has not been debarred from participating in public procurement.
- (b) Has not been involved in and will not be involved in corrupt and fraudulent practices regarding public procurement.

.....
(Title)

.....
(Signature)

.....
(Date)

Official Stamp:

(To be signed by authorized representative and officially stamped)

SECTION 4: INSTRUCTIONS TO BIDDERS

SECTION 4: INSTRUCTIONS TO BIDDERS

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SECTION 4: CONDITIONS OF BID AND INSTRUCTIONS TO BIDDERS

GENERAL

- | | |
|----------------------------|---|
| 1. Scope Of Bid | <p>1.1 The Employer, as defined in the Conditions of Contract, Part II and Appendix to Form of Bid, hereinafter referred to as “the Employer,” wishes to receive bids for the construction of Works, as described in Section 1, Clause 102 of the Special Specifications (Location and extent of the works).</p> <p>1.2 The successful bidder will be expected to complete the Works within the period stated in the Appendix to Form of Bid from the date of commencement of the Works.</p> <p>1.3 Throughout these bidding documents, the terms “bid” and “tender” and their derivatives (“bidder/tenderer”, “bid/tendered,” “bidding/tendering,” etc.) are synonymous, and day means calendar day. Singular also means plural.</p> |
| 2. Source of Funds | <p>2.1 The source of funding is the Government of Kenya through the development vote.</p> |
| 3. Eligible Bidders | <p>3.1 This invitation to bid is open to any bidder (including all members of a joint venture and all subcontractors of a bidder) meeting all three of the following requirements:</p> <p>(a) A bidder shall not be affiliated with a firm or entity</p> |

- (i) That has provided consulting services related to the Works to either the Employer during the preparatory stages of the Works or of the Project of which the Works form a part,
- (ii) That has been hired (or is proposed to be hired) by the Employer as an Engineer for the contract.

(b) A bidder shall be pre-qualified for the contract as notified by the Employer

3.2 Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer as the Employer shall reasonably request.

4. Qualification of the Bidder

4.1 Bidders shall, as part of their bid,;

- (a) Submit a written power of attorney authorizing the signatory of the bid to commit the bidder; and
- (b) Update any information submitted with their applications for prequalification, which has changes, and update in any case the information indicated in the Bidding Data, and continue to meet the minimum threshold criteria set out in the prequalification documents.

As a minimum, bidders shall update the following information:

- (a) Evidence of access to lines of credit and availability of other financial resources
- (b) Financial predictions for the current year and the two following years, including the effect of known commitments
- (c) Work commitments acquired since prequalification.
- (d) Current litigation information, and
- (e) Availability of critical equipment.

4.2 Bids submitted by a joint venture of two or more firms as partners shall comply with the following requirements:

- (a) The bid shall include all the information listed in Sub-Clause 4.1 above.
- (b) The bid and, in case of a successful bid, the Agreement shall be signed so as to be legally binding on all partners.
- (c) One of the partners shall be nominated as being in charge and this authorization shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners.

- (d) The partner in charge shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture and the entire execution of the contract including payment shall be done exclusively.
- (e) All partners of the joint venture shall be liable jointly and severally for the execution of the contract in accordance with the contract terms, and a statement to this effect shall be included in the authorization mentioned under Sub-clause 4.2 (c) above as well as in the bid and in the Agreement, in case of successful bid, and
- (f) A copy of the agreement entered into by the joint venture partners shall be submitted with the bid.

4.3 Bidders shall also submit proposals of work methods and schedule in sufficient details to demonstrate the adequacy of the bidders' proposals to meet the technical specifications and the completion time referred to in Sub-clause 1.2 above.

5. One Bid per Bidder

5.1 Each bidder shall submit only one bid either by himself or as a partner in a joint venture. A bidder who submits or participants in more than one bid, other than alternatives pursuant to Clause 17 below, will be disqualified.

6. Cost of Bidding

6.1 The bidder shall bear all costs associated with the preparation and submission of its bid and the Employer will in no case be responsible or liable for those costs regardless of the conduct or outcome of the bidding process.

7. Site Visit

7.1 The bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the bidder's own expense.

7.2 The bidder and any of its personnel or agents will be granted permission by the Employer to enter upon its premises and lands for the purpose of such visit, but only upon the express condition that the bidder, its personnel, and agents will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof, and will be responsible for death or personal

injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.

7.3 The Employer may conduct a Site visit concurrently with the pre-bid meeting referred to in Clause 18.

7.4 The bidder's representative should be technically qualified with at least a degree in civil engineering. He must also be one of the key people listed in the schedule of key personnel.

BIDDING DOCUMENTS

8. Content of Bidding Documents

8.1 The bidding documents are those stated below and should be read in conjunction with any Addenda issued if any in accordance with Clause 11 below.

1. Form of Bid
2. Appendix to Form of Bid
3. Bid Security
4. Instructions to Bidders
5. Bidding Data
6. Conditions of Contract, Part I
7. Conditions of Particular Application, Part II
8. Standard Specifications
9. Special Specifications
10. Form of Contract Agreement
11. Bill of Quantities
12. Drawings
13. Tender addenda [tender notices]

8.2 The bidder is expected to examine carefully all instructions, conditions, forms, terms, specifications and drawings in the bidding documents. Failure to comply with the requirements of bid submission will be at the bidder's own risk. Bids that are not substantially responsive to the requirements of the bidding documents will be rejected.

9. Clarification of Bidding Documents

9.1 A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by cable (hereinafter, the term "cable" is deemed to include telex and facsimile) at the Employer's address indicated in the Appendix to the Form of Bid. The

Employer will respond to any request for clarification that he receives earlier than fourteen (14) days prior to the deadline for submission of bids. Copies of the Employer's response will be forwarded to all purchasers of the bidding documents, including a description of the inquiry but without identifying its source.

**10. Amendment of
Bidding
Documents**

- 10.1 At any time prior to the deadline for submission of bids, the Employer may amend the bidding documents by issuing Addenda.
- 10.2 Any Addendum thus issued shall be part of the bidding documents pursuant to Sub-clause 9.1 above and shall be communicated in writing or by cable to all purchasers of the bidding documents.
- Prospective bidders shall promptly acknowledge receipt of each Addendum by cable to the Employer.
- 10.3 To give prospective bidders reasonable time in which to take an Addendum into account in preparing their bids, the Employer, in accordance with Clause 21.2, may extend as necessary the deadline for submission of bids.

PREPARATION OF BIDS

11. Language of Bid

- 11.1 The bid, and all correspondence and documents related to the bid exchanged by the Bidder and the Employer, shall be written in English Language. Supporting documents and printed literature furnished by the bidder may be in another language provided they are accompanied by an accurate translation of the relevant passages in the above stated language, in which case, for purposes of interpretation of the bid, the English Language shall prevail.

**12. Documents
Comprising the Bid**

- 12.1 The bid submitted by the bidder shall comprise the following: duly filled-in Form of Bid and Appendix to Form of Bid, Bid Security, priced Bill of Quantities, alternative offers where invited, and any information or other materials required be completing and submitting by bidders in accordance with these Instructions to Bidders. The documents in this bidding process shall be filled in without exception, subject to extensions thereof in the same format and to the provisions of Sub-clause 16.2 regarding the alternative forms of bid security.

13. Bid Prices

- 13.1 Unless stated otherwise in the bidding documents, the Contract shall be for the whole Works as described in Sub-clause 1.1, based on the unit rates and prices in the Bill of Quantities submitted by the bidder.
- 13.2 The bidder shall fill in rates and prices for all items of the Works described in the Bill of Quantities. Items against which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the rates for other items and prices in the Bill of Quantities.
- 13.3 All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause, as of the date 28 days prior to the deadline for submission of bids, shall be included in the rates and prices and the total Bid Price submitted by the bidder.
- 13.4 Unless otherwise provided in the Bidding data and Conditions of Particular Application, the rates and prices quoted by the bidder are subject to adjustment during the performance of the Contract in accordance with the provisions of Clause 70 of the Conditions of Contract. The bidder shall furnish the indices and weightings in the Appendix to Form of Bid for the price adjustment formulae, and shall submit with its bid such other supporting information as required under Clause 70 of the Conditions of Contract. The Employer may require the bidder to justify its proposed weightings.

14. Currencies of Bid and Payment

- 14.1 The currency (ies) of the bid shall be in Kenya Shillings.

15. Bid Validity

- 15.1 Bids shall remain valid and open for acceptance for a period of 120 Days from the specified date of bid opening stated under Clause 21 below.
- 15.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders to extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing or by cable. A bidder may refuse the request without forfeiting its bid security. A bidder agreeing to the request will not be required or permitted to modify its bid, but will be required to extend the validity of its bid security for the period of the extension and in compliance with Clause 16 below in all respects.

15.3 In the case of contracts in which the Contract Price is fixed (not subject to price adjustment), if the period of bid validity is extended beyond eight weeks, the amounts payable in local and foreign currency to the bidder selected for award, shall be increased by applying to both the local and foreign currency component of the payments, respectively, the factors specified in the Bidding Data or in the request for extension, for the period of delay beyond eight weeks after the expiry of the initial bid validity, up to the notification award. Bid evaluation will be based on the bid prices without taking into consideration the above correction.

16. Bid Security

16.1 The bidder shall furnish, as part of its bid, a Bid Security in the amount stipulated in the Appendix to the Form of Bid in the currency of the Employer's country, or the equivalent amount in a freely convertible currency.

16.2 The bid security shall be in the form of a bank guarantee from a reputable bank selected by the bidder and located in any eligible country. The format of the bank guarantee shall be in accordance with the form of bid security included in Section 3 of this Volume I bidding document. Bid security shall remain valid for a period of 30 days beyond the original validity period for the bid, and beyond any period of extension subsequently requested under Sub-clause 15.2 above.

16.3 Any bid not accompanied by an acceptable bid security shall be rejected by the Employer as non-responsive. The bid security of a joint venture must be in the name of the joint venture submitting the bid.

16.4 The bid securities of unsuccessful bidders will be returned as promptly as possible, but not later than 30 days after the expiration of the period of bid validity.

16.5 The bid security of the successful bidder will be returned when the bidder has signed the Agreement and furnished the required performance security.

16.6 The bid security may be forfeited:

- (a) If the bidder withdraws its bid, except as provided in Sub-clause 23.2 below
- (b) If the bidder does not accept the corrections of its Bid Price, pursuant to Sub-clause 28.2 below.

(c) In the case of a successful bidder, if he fails within the specified time limit to

- (i) Sign the Agreement, or
- (ii) Furnish the required Performance Security.

**17. Alternative
Proposals by
Bidders**

17.1 When alternative times for completion are explicitly invited, a statement to that effect will be included in the Bidding Data Sheet and Conditions of Contract, as will the method of evaluating different times for completion.

17.2 Except as provided under Clause 17.3 below, bidders wishing to offer technical alternatives to the requirements of the bidding documents must first price the Employer's design as described in the bidding documents and shall further provide all information necessary for a complete evaluation of the alternatives by the Employer, including drawings, design calculations, technical specifications, breakdown of prices, and proposed construction methodology and other relevant details. Only the technical alternatives, if any, of the lowest evaluated bidder conforming to the basic technical requirements shall be considered by the Employer.

17.3 When bidders are permitted to submit alternative technical solutions for specified parts of the Works, such parts shall be described in Section 8, Technical Specifications.

18. Pre-Bid Meeting

18.1 The bidder's designated representative is invited to attend a pre-bid meeting, which, if convened, will take place at the venue and time in the letter of Invitation to Bid.

18.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

18.3 The bidder is requested, as far as possible, to submit any questions in writing or by cable, to reach the Employer not later than one week before the meeting. It may not be practicable at the meeting to answer questions received late, but questions and responses will be transmitted in accordance with Sub-clause 18.4 below.

18.4 Minutes of the meeting, including the text of the questions raised and the responses given, together with any responses prepared after the meeting, will be transmitted without delay to all purchasers of the

bidding documents. Any modification of the bidding documents that may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause 10.1 above and not through the minutes of the pre-bid meeting.

18.5 Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

19. Format and Signing of Bid

19.1 The bidder shall prepare one original of the documents comprising the bid as described under Clause 8 of these Instructions to Bidders, bound with the section containing the Form of Bid and Appendix to Form of Bid, and clearly marked 'original'. In addition, the bidder shall submit copies of the bid, in the number specified in the Bidding Data and Appendix to Form of Bid and clearly marked 'copies'. In the event of discrepancy between them, the original shall prevail.

19.2 The original and all copies of the bid shall be typed or written in indelible ink (in the case of copies, photocopies are also acceptable) and shall be signed by a person or persons duly authorized to sign on behalf of the bidder, pursuant to Sub-clauses 4.1 (a) or 4.2 (c) above, as the case may be. All pages of the bid where entries or amendments have been made shall be initialled by the person or persons signing the bid.

19.3 The bid shall contain no alterations, omissions, or additions, unless such corrections are initialled by the person or persons signing the bid.

SUBMISSION OF BIDS

20. Sealing and Marking of Bids

20.1 The bidder shall seal the original and each copy of the bid in separate envelopes, duly marking the envelopes as "original" and "copies". The envelopes shall then be sealed in an outer envelope.

20.2 The inner and outer envelopes shall:

- (a) Be addressed to the Employer at the address provided in the Appendix to Form of Bid
- (b) Bear the name and identification number of the Contract.
- (c) Provide a warning not to open before the time and date for bid opening, as specified in the Letter of invitation to bid.

20.3 In addition to the identification required under Sub-clause 20.2 above, the inner envelopes shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared “late” pursuant to Clause 22.1 below, and for matching purposes under Clause 23 below.

20.4 If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the bid. If the outer envelope discloses the bidder’s identity, the Employer will not guarantee the anonymity of the bid submission, but this shall not constitute grounds for rejection of the bid.

**21. Deadline for
Submission of Bids**

21.1 Bids must be received by the Employer at the address specified under Sub-clause 20.2, not later than the time and date stipulated in the Letter of invitation to Bid.

21.2 The Employer may, in exceptional circumstances and at its discretion, extend the deadline for submission of bids by issuing an Addendum in accordance with Sub-clause 10.1 above, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will thereafter be subject to the deadline as extended.

22. Late Bids

22.1 Any bid received by the Employer after the deadline for submission of bids prescribed under Sub-clause 21.1 will be returned to the bidder unopened.

**23. Modification and
Withdrawal of Bids**

23.1 The bidder may modify, substitute, or withdraw its bid after bid submission, provided that written notice of the modification or withdrawal is received by the Employer prior to the deadline for submission of bids.

23.2 The bidder’s modification, substitution, or withdrawal notice shall be prepared, sealed, marked, and delivered in accordance with the provisions of Clause 20 above, with the outer and inner envelopes additionally marked ‘modification’ or “withdrawal,” as appropriate.

23.3 No bid may be modified by the bidder after the deadline for submission of bids, except in accordance with Sub-clause 28.2 below.

23.4 Except as provided under Sub-clause 23.2 above, withdrawal of a bid during the interval between the deadline for submission of bids and expiration of the period of bid validity specified under Clause 15 above

may result in the forfeiture of the bid security pursuant to Sub-clause 16.7 above.

BID OPENING AND EVALUATION**24. Bid Opening**

- 24.1 The Employer will open the bids, including withdrawals and modification made pursuant to Clause 23 above, in the presence of bidders' designated representatives who choose to attend, at the time, date and location stipulated in the Letter of Invitation to Bid. The bidders' representatives who would be present shall sign a register evidencing their attendance.
- 24.2 Envelopes marked "withdrawal" and 'substitution' shall be opened first, and the name of the bidder shall be read out. Bids for which an acceptable notice of withdrawal has been submitted pursuant to Clause 23 above shall not be opened.
- 24.3 The bidders' names, the bid prices, including any alternative Bid Price or deviation, any discounts, bid modifications and withdrawals, the presence (or absence) of bid security, will be announced by the Employer at the opening. Further, other details as the Employer, at its discretion, may consider appropriate, shall also be announced and recorded. Subsequently, all envelopes marked 'modification' shall be opened and submission therein read out in appropriate detail. No bid shall be rejected at bid opening except for late bids pursuant to Clause 22 above.
- 24.4 Bids not opened and read out at bid opening shall not be considered further for evaluation, irrespective of the circumstances. In particular, any discount offered by a bidder which is not read out at the bid opening shall not be considered further for evaluation.
- 24.5 The Employer shall prepare minutes of the bid opening, including the information disclosed during the bid opening to those present in accordance with Sub-clause 24.3 above.

**25. Process to Be
Confidential**

- 25.1 Information relating to the examination, clarification, evaluation, and comparison of bids, and recommendations for the award of a contract, shall not be disclosed to bidders or any other persons not officially concerned with such process until the award to the successful bidder has been announced. Any effort by a bidder to influence the Employer's processing of bids or award decisions may result in the rejection of the bidder's bid.

**26. Clarification of
Bids and**

- 26.1 To assist in the examination, evaluation, and comparison of bids, the Employer may, at its discretion, ask any bidder for clarification of its bid,

Contacting the Employer

including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the bids in accordance with Clause 28 below.

- 26.2 Subject to Sub-clause 26.1, no bidder shall contact the Employer on any matter relating to its bid from the time of the bid opening to the time the contract is awarded. If the bidder wishes to bring additional information to the notice of the Employer, he should do so in writing.
- 26.3 Any efforts by the bidder to influence the Employer in the Employer's bid evaluation, the bid comparison or contract award decisions may result in the rejection of the bidder's bid.

27. Examination of Bids and Determination of Responsiveness

- 27.1 Prior to the detailed evaluation of bids, the Employer will determine whether each bid (a) has been properly signed; (b) is accompanied by the required securities; (c) is substantially responsive to the requirements of the bidding documents as set out in the Bidding Documents and (d) provides any clarification and/or substantiation that the Employer may require to determine responsiveness pursuant to Sub-clause 28.2 below. Furthermore, the bidder shall, if required, provide substantiation that the Employer may require, pursuant to Sub-clause 14.5 above.
- 27.2 A substantially responsive bid is one that conforms to all the terms, conditions, and specifications of the bidding documents without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the bidding documents, the Employer's rights or the bidder's obligations under the contract; or (c) whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive bids.
- 27.3 If a bid is not substantially responsive, it will be rejected by the Employer and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

28. Correction of Errors

28.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:

- (a) Where there is a discrepancy between the amounts in figures and in words, the amount in words will govern, and
- (b) Where there is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the line item total as quoted will govern.
- (c) In the event of a discrepancy between the bid amount as stated in the Form of Bid and the corrected bid figure in the main summary of the Bills of Quantities, the amount as stated in the form of bid shall prevail.
- (d) The error correction factor shall be computed by expressing the difference between the bid amount and the corrected bid sum as a percentage of the corrected contractor's work (ie corrected tender sum less prime cost and Provisional sums)
- (e) The error correction factor shall be applied to all the contractor's work (as a rebate or addition as the case may be) for the purposes of valuations for interim certificates and valuations of variations

28.2 The amount stated in the bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, with the concurrence of the bidder, shall be considered as binding upon the bidder. If the bidder does not accept the corrected amount of bid, its bid will be rejected, and the bid security may be forfeited in accordance with Sub-clause 16.7 above.

**29. Conversion to
Single Currency
for Comparison of
Bids**

29.1 For comparison of bids, the Bid Price shall first be broken down into the respective amounts payable in various currencies by using the exchange rates specified by the bidder in accordance with Sub-clause 14.3 above.

Option 1:

To be used with
Clause 14, Option
A

29.2 In the second step, the Employer will convert the amounts in various currencies in which the Bid Price is payable (excluding Provisional Sums but including Day works where priced competitively) to either:

- (a) The currency of the Employer's country at the selling rates established for similar transactions by the authority specified in the Contract on the date stipulated in the Bidding Data, or
- (b) A currency widely used in international trade, such as the US. Dollar, stipulated in the Bidding data, at the selling rate of exchange published in the international press as stipulated in the Bidding Data on the date stipulated in the Bidding Data, for the amounts payable in foreign currency; and, at the selling exchange rate established for similar transactions by the same authority specified under Clause 29.2 (a) above on the date specified in the Bidding Data for the amount payable in the currency of the Employer's country.

Option 2:

To be used with
Clause 14, Option
B

29.3 The Employer will convert the amounts in various currencies in which the Bid Price is payable (excluding Provisional Sums but including Day works where priced competitively) to either:

- (a) The currency of the Employer's country at the selling rates established for similar transactions by the authority specified in the Bidding Data on the date stipulated in the Bidding Data; or
- (b) A currency widely used in international trade, such as the US. Dollar, stipulated in the Bidding data, at the selling rate of exchange published in the international press as stipulated in the Bidding Data on the date stipulated in the Bidding Data, for the amounts payable in foreign currency; and, at the selling exchange rate established for similar transactions by the same authority specified in Clause 29.2(a) above on the date specified in the Bidding Data for the amount payable in the currency of the Employer's country.

**30. Evaluation and
Comparison of
Bids**

30.1 The Employer will evaluate and compare only the bids determined to be substantially responsive in accordance with Clauses 27 and 28 above.

30.2 In evaluating the bids, the Employer will determine for each bid the Evaluated Bid Price by adjusting the Bid Price as follows:

- (a) Making any correction for errors pursuant to Clause 28 above.
- (b) Excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities, but including Day works, where priced competitively.
- (c) Converting the amount resulting from applying (a) to (b) above to a single currency in accordance with Clause 29 above.
- (d) Making an appropriate adjustment on sound technical and/or financial grounds for any other quantifiable acceptable variations, deviations, or alternative offers.
- (e) Making an allowance for varying times for completion offered by bidders, if permitted in the Bidding Data and in the manner prescribed therein; and

- 30.3 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer. Variations, deviations, alternative offers, and other factors that are in excess of the requirements of the bidding documents shall not be taken into account in bid evaluation.
- 30.4 The estimated effect of the price adjustment provisions of the Conditions of Contract, applied over the period of execution of the Contract, shall not be taken into account in bid evaluation.
- 30.5 If the bid, which results in the lowest Evaluated Bid Price, is seriously unbalanced or front loaded in relation to the Engineer's estimate of the items of work to be performed under the Contract, the Employer may require the bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analyses, taking into consideration the schedule of estimated Contract payments, the Employer may require that the amount of the performance security set forth under Clause 35 below be increased at the expense of the bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful bidder under the Contract.

AWARD OF CONTRACT

31. Award

- 31.1 Subject to Clause 33 below, the Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive to the bidding documents and who has offered the lowest Evaluated Bid Price pursuant to Clause 30 above, provided that such bidder has been determined to be (a) eligible in accordance with the provisions of Sub-clause 3.1 above and (b) qualified in accordance with the provisions of Clause 4 above.

32. Employer's Right to Accept Any Bid and to Reject Any or All Bids

- 32.1 The Employer reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the Employer's action.

33. Notification of Award

33.1 Prior to expiration of the period of bid validity prescribed by the Employer, the Employer will notify the successful bidder in a letter stating that his bid has been accepted. This letter (hereinafter and in the Conditions of Contract called the “Letter of Acceptance”) shall specify the sum that the Employer will pay the Contractor in consideration of the execution and completion of the Works and the remedying of any defects therein by the Contractor as prescribed by the Contract (hereinafter and in the Conditions of Contract called “the Contract Price”).

34. Signing of Agreement

34.1 At the same time that the Employer notifies the successful bidder that his bid has been accepted, the Employer will send the bidder the Agreement in the form provided in the bidding documents, incorporating all agreements between the parties.

34.2 Within 28 days of receipt of the Agreement, the successful bidder shall sign the Agreement and return it to the Employer, together with the required performance security.

35. Performance Security

35.1 Within 28 days of receipt of the Letter of Acceptance from the Employer, the successful bidder shall furnish to the Employer a performance security in the form stipulated in the Bidding Data and the Conditions of Contract. The form of performance security provided in Section 7 of the bidding documents may be used or some other form acceptable to the Employer.

35.2 If it is stipulated in the Contract that the performance security is to be provided by the successful bidder in the form of a bank guarantee, it shall be issued either at the bidder’s option, by a bank located in the country of the Employer or by a foreign bank through a correspondent bank located in the country of the Employer, or (b) with the prior agreement of the Employer directly by a foreign bank acceptable to the Employer.

35.3 If it is stipulated in the Bidding Data that the performance security may also be provided in the form of a bond, it shall be issued by a bonding or insurance company that has been determined by the successful bidder to be acceptable to the Employer.

35.4 Failure of the successful bidder to comply with the requirements of Clause 35 above shall constitute a breach of Contract, cause for

annulment of the award, forfeiture of the bid security and any such other remedy the Employer may take under the Contract, and the Employer may resort to awarding the Contract to the next ranked bidder.

**36. Disputes Review
Method**

36.1 The method of dispute resolution is indicated in the Bidding Data. If the selected method is a Dispute Review Board or Disputes Review Expert, the Employer proposes the person named in the Bidding Data to be appointed as Board member. If the Bidder disagrees with this proposal, the bidder should state so in the bid. If the Employer and the selected bidder cannot agree to the appointment of the two initial Board members, then the appointments will be made by the Appointing Authority designated in the Conditions of Contract at the request of either party.

**37. Corrupt &
Fraudulent
Practices**

37.1 The Employer requires the bidders/suppliers/contractors to observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy, the Employer:

- (a) Defines, for the purposes of this provision, the terms set forth below as follows:
 - (i) “Corrupt practice” means the offering, giving, receiving, or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution, and
 - (ii) “Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer.
- (b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the Contract in question.
- (c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded the Contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, the Contract.

37.2 Furthermore, bidders shall be aware of the provision stated under Sub-clauses 26.2 and 63.5 of the Conditions of Contract.

APPENDIX TO INSTRUCTION TO TENDERERS

TABLE 1: PRE- QUALIFICATION CHECKLIST FOR COMPLETENESS AND RESPONSIVENESS

S/No.	Completeness and Responsiveness Criteria	References	Requirement
1.	Form of Bid	Section 1 Clause 20.2	- Amount must be indicated - Properly fill and sign
2.	Appendix to Form of Bid	Clause 20.2 Section 2	- Form properly sign
3.	Bid Security	Section 3, Item 3.3 Clause 16/17	- Unconditional bank guarantee - In the format provided with all conditions
4.	Confidential Business Questionnaire	Section 3, Item 3.10	- Properly fill and sign - Provide all required information
5.	Form of Power of Attorney	Section 3, Item 3.16 Clause 5.1 (a)	- Properly fill and sign - Provide copies of National Identification card or Passport.
6.	Tax Compliance Certificate	Employer's notice	- Copy of certificate Certified by Commissioner of Oaths - Valid
7.	Registration with National Construction Authority	Employer's notice Item 6.1.4 of QC	- Category 2 OR 3 - Copy of certificate Certified by Commissioner of Oaths
8.	Certificate of Incorporation	Employer's notice Item 6.1.4 of QC	- Copy of certificate Certified by Commissioner of Oaths
9.	Priced Bill of Quantities	Clause 14.1 Section 10	- Fill all rates, prices and amounts
10.	Eligibility	Section 3, Item 3.10 Clause 4.1/4.2	- Copies of National ID or passport for all directors - Copy of Form CR12 Certified by Commissioner of Oaths
11.	Conflict of interest	Section 3, Item 3.10 Clause 4.2	- to state explicitly
12.	Debarment	Section 3, Item 3.22	- Properly fill and sign
13.	Pending Litigation	Item 6.2.2 of QC	- Provide Sworn affidavit
14.	Litigation History	Section 3, Item 3.22	- Fill in information and sign
15.	Non-completed works beyond completion date	Section 3, Item 3.18 Item 6.1.3 of QC	- Fill information on non-completed works
16.	Certificate of Tenderers Visit to Site	Clause 8.1/8.3 Section 3, Item 3.15	- Attend pre-bid meeting/visit - Bidders to sign attendance register - Certificate must be signed by the Employer's representative
17.	Schedule of Major Items of Plant	Item 6.7 of QC Section 3, Item 3.12	- Properly fill and sign
18.	Schedule of Key Personnel	Item 6 of QC Section 3, Item 3.17	- Properly fill and sign

19.	Roadwork Completed Satisfactorily	Item 4 of QC Section 3, Item 3.18	~ Properly fill and sign
20.	Schedule of Ongoing Projects	Item 5.1 of QC Section 3, Item 3.19	~ Properly fill and sign
21.	Schedule of other Supplementary Information / Financial Standings	Item 5.1 of QC Section 3, Item 3.20/Item 3.21	~ Properly fill and sign
22.	Copy of Bid Document	Clause 20.1	~ Replica of the original
REMARKS		Clause 13.1/20.2	~ Bid document to be complete, properly filled and signed.

Key: QC – Qualification Criteria

TABLE 2: POST- QUALIFICATION CRITERIA

ITEM		DESCRIPTION	SCORE
1		FINANCIAL CAPACITY	YES/NO
	a	Audited Statements	Yes/No
	b	Cash flow statement (forecasts)	Yes/No
	c	Financial position/Ratios	Yes/No
	d	Bank statement	Yes/No
	e	Turnover	Yes/No
2		EXPERIENCE	
		General Experience	Yes/No
		Specific experience in related works	Yes/No
3		CURRENT COMMITMENTS	
		On-going works	Yes/No
4		KEY PERSONNEL	
		Site Agent	Yes/No
		Deputy Site Agent / Site Engineer	Yes/No
		Surveyor	Yes/No
		Foremen ~ 4 No. (General, Earthworks, Concrete, Bituminous Works)	Yes/No
		Materials Technologist	Yes/No
5		PLANT AND EQUIPMENT	
		Equipment capabilities	Yes/No
6		WORK METHODOLOGY	Yes/No
		REMARKS	Yes/No

Bidders must achieve YES in all the measured parameters to qualify.

The bidders who pass the technical criteria will be subjected to financial evaluation

SECTION 5: BIDDING DATA

SECTION 5: BIDDING DATA

Whenever there is a conflict, the provisions herein shall prevail over those in the instructions to bidders.

Instructions to Bidders Clause Reference	Bidding data
11.1	Bidding language is English
14.1	The currency of the bid shall be Kenya Shillings
14.4	The contract is subject to price adjustment
17.1	There will be no alternative times for completion
17.2	Alternative Times of completion: Not Applicable
19.1	The number of copies of the bid to accompany the original shall be three (3).
29	Deleted
30.2(e)	Alternative times for completion will be evaluated as follows: Not Applicable
35.1	The Performance Security shall be in the form given in Section 3, Item 3.7.
35.3	Apart from the stipulation of Clause 35.1 of these Instructions to Bidders, there shall be no other form of Performance Security submission.
36.1	The method of dispute resolution shall be arbitration and the arbitrator shall be a person to be agreed between the parties or failing agreement. The arbitrator shall be appointed by The Chairman Institute of Arbitrators of Kenya.

SECTION 6: QUALIFICATION CRITERIA

SECTION 6: QUALIFICATION CRITERIA

This Section contains all the factors, methods and criteria that the Employer shall use to evaluate applications. The information to be provided in relation to each factor and the definitions of the corresponding terms are included in the respective Application Forms.

Contents

5.1	ELIGIBILITY	ERROR! BOOKMARK NOT DEFINED.
5.2	HISTORICAL CONTRACT NON-PERFORMANCE.....	ERROR! BOOKMARK NOT DEFINED.
5.3	FINANCIAL SITUATION.....	ERROR! BOOKMARK NOT DEFINED.
5.4	EXPERIENCE	ERROR! BOOKMARK NOT DEFINED.
5.5	CURRENT COMMITMENTS	ERROR! BOOKMARK NOT DEFINED.
5.6	PERSONNEL CAPABILITY	ERROR! BOOKMARK NOT DEFINED.
5.7	SCHEDULE OF THE MAJOR ITEMS OF PLANT TO BE USED ON THE PROPOSED CONTRACT.	ERROR! BOOKMARK NOT DEFINED.

No.	Subject	Requirement	Single Entity	Joint Venture			Submission Requirements
				All Parties Combined	Each Party	One Party	
6.1	Eligibility						
6.1.1	Nationality	Nationality in accordance with ITB Sub clause 3.2.	Must meet requirement	Existing or intended JV must meet requirement	Must meet requirement	N / A	Section 3, Item 3.8
6.1.2	Conflict of interest	No conflicts of interest as described in ITB Sub clause 3.1(a) i & ii	Must meet requirement	Existing or intended JV must meet requirement	Must meet requirement	N / A	Section 3, Item 3.8
6.1.3	Employer Ineligibility	Not having been declared ineligible by the Employer, as described in Sub clause 3.1(a) i & ii	Must meet requirement	Existing JV must meet requirement	Must meet requirement	N / A	Section 3, Item 3.8
6.1.4	Incorporation & Registration	Applicant required to meet conditions of ITB Clause 4. Pursuant to Clause 4, the following shall be submitted; -Certified copies of Certificate of Incorporation to show that the applicant is a registered company and legally authorized to do business in Kenya. - Proof of registration with National Construction Authority Category 3 - Certified copies of Tax Compliance Certificate, PIN number.	Must meet requirement	Must meet requirement	Must meet requirement	N / A	Section 3, Item 3.8

No.	Subject	Requirement	Single Entity	Joint Venture			Submission Requirements
				All Parties Combined	Each Party	One Party	
6.2	Historical Contract Non-Performance						
6.2.1	History of Non-Performing Contracts	Non-performance of a contract did not occur within the last five (5) years prior to the deadline for application submission based on all information on fully settled disputes or litigation. A fully settled dispute or litigation is one that has been resolved in accordance with the Dispute Resolution Mechanism under the respective contract, and where all appeal instances available to the applicant have been exhausted.	Must meet requirement by itself or as party to past or existing JV	N / A	Must meet requirement by itself or as party to past or existing JV	N / A	Section 3, Item 3.16

6.2.2	Pending Litigation	All pending litigation shall in total not represent more than Fifty percent (50%) of the Applicant's net worth and shall be treated as resolved against the Applicant.	Must meet requirement by itself or as party to past or existing JV	N / A	Must meet requirement by itself or as party to past or existing JV	N / A	Section 3, Item 3.20
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No.	Subject	Requirement	Single Entity	Joint Venture			Submission Requirements
				All Parties Combined	Each Party	One Party	
6.3	Financial Situation						
6.3.1	Financial Performance	Submission of audited financial statements or if not required by the law of the applicant's country, other financial statements acceptable to the Employer, for the last five [5] years to demonstrate: a) The current soundness of the applicants financial position and its prospective long term profitability, and b) Capacity to have and meet the construction cash flow of KShs. 200 Million	Must meet requirement <				

6.3.2	Average Annual Construction Turnover	Minimum average annual construction turnover calculated as total certified payments received for contracts in progress or completed, within the last five (5) years: KShs. 200 million	Must meet requirement	Must meet requirement	Must meet	N/A	Section 3, Item 3.18

No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
6.4	Experience						
6.4.1	General Construction Experience	Experience under construction contracts in the role of contractor, subcontractor for at least the last five (5) years prior to the applications submission deadline	Must meet requirement	N / A	Must meet requirement	N / A	Section 3, Item 3.16
6.4.2 (a)	Specific Construction Experience	a) Participation as contractor, management contractor or subcontractor, in at least one (1) contract within the last five (5) years that have been successfully and substantially completed and that are similar to the proposed works. The similarity shall be based on the physical size, complexity, methods/technology or	Must meet requirement	Must meet requirement	N / A	Must meet requirement for one contract	Section 3, Item 3.16

No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
		other characteristics as described in Section 8, Special Specification					
No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
6.4.2 (b)		b) For the above or other contracts executed during the period stipulated in 5. 4.2 (a) above, a minimum construction experience in the following key activities: (i) Earthworks per month: 5,000 m ³ (ii) Stabilized Subbase/base: 500m ³ per month.	Must meet requirements	Must meet requirement	N / A	Must meet requirement	

No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
		(iii) Asphalt concrete: 500 m ³ per month (iv) Drainage culverts, slabs and Channels: 400 m per month (v) Concrete Works for bridges: 200 m ³ per month. (vi) Subsurface drains: 500 m per month.					
No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
6.5.1	On-going contracts	The total value of outstanding works on the on-going contracts must comply to the requirement. The maximum number of projects with the	Must meet requirement	Must meet Requirement	Must meet [100-]/n-1]% of the requirement where n= no of joint venture members	N/A	Section 3, Item 3.17

No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
		Authority should not exceed three (3)					
6.6	Personnel Capability						
6.6.1		Provide detailed CVs of all proposed personnel & certified copies of certificates, practicing licenses & academic documents; The site staff shall possess minimum levels set below (NB: Annual Practicing License is mandatory for Engineers);					
(a)	Site Agent	Qualification: BSc. Civil Eng and/or equivalent Be Registered with EBK as a professional Engineer and/or Professional Bodies	Must meet requirements	Must meet requirements	N/A	Must meet requirements	Section 3, Item 3.15

No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
		Registration (attach current practising licence) General Experience: 15 years Specific Experience in similar works: 10 years Specific Experience as manager of similar works: 5 years					
(b)	Deputy Site Agent	Qualification: B.Sc. Civil Eng and/or equivalent Be Registered with EBK General Experience: 10 years Specific Experience in similar works: 7 years.	Must meet requirements	Must meet requirements	N/A	Must meet requirements	Section 3, Item 3.15

No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
(c)	Site Engineer	Qualification: B.Sc. Civil Eng and/or equivalent Be Registered by EBK and/or Professional Bodies Registration (attach current practising licence) General Experience: 8 years Specific Experience in similar works: 6 years	Must meet requirements	Must meet requirements	N/A	Must meet requirements	Section 3, Item 3.15
No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
(d)	Site Surveyor	Qualification: BSc Surveying Eng and/or Equivalent General Experience: 10 years Specific Experience in similar works: 8 years	Must meet requirements	Must meet requirements	N/A	N/A	Section 3, Item 3.15

No.	Subject	Requirement	Single Entity	Joint Venture			
				All Parties Combined	Each Party	One Party	
(e)	Foremen	Qualification: Higher National Diploma in Civil Engineering. General Experience: 10 years Specific Experience in similar works: 8 years	Must meet requirements	Must meet requirements	N/A	N/A	Section 3, Item 3.15

BIDDERS ARE INFORMED THAT APART FROM THE ABOVE THEY MUST MEET THE REQUIREMENTS OF THE PUBLIC PROCUREMENT AND DISPOSAL ACT 2015 ESPECIALLY SECTION 31 OF THE ACT.

Clauses 14.1 and 14.2

The currency of the bid shall be Kenya Shillings

Clause 17.1

There will be no alternative times for completion.

Clause 19.1

The number of replica copies of the bid to accompany the original shall be one (1).

Clauses 29.2 (a) and 29.2 (b)

The currency of the Employer's country at the selling rates established for similar transactions by the Central Bank shall be on the date 28 days prior to the date of opening the bids.

Clause 35.1

The Performance Security shall be in the form given in Section 3, Item 3.7.

Clause 35.3

Apart from the stipulation of Clause 35.1 of these Instructions to Bidders, there shall be no other form of Performance Security submission.

Clause 36.1

The method of dispute resolution shall be arbitration and the arbitrator shall be a person to be agreed between the parties or failing agreement, the arbitrator shall be appointed by the Chairman of Chartered Institute of Arbitrators of Kenya.

6.7 Schedule of the Major Items of Plant to Be Used On the Proposed Contract.

The Bidder must indicate the core plant and equipment considered by the company to be necessary for undertaking the project together with proof ownership. (* Mandatory minimum number of equipment required by the Employer for the execution of the project that the bidder must make available for the Contract).

Item No.	Equipment Details	*Minimum Number Required for the Contract Execution	No of Equipment Owned by the Bidder	No. of equipment to be hired/ purchased by the Bidder	No. of equipment to be made available for the Contract by the Bidder
1	A) General Plant				
	1. Primary/Secondary Crusher Unit/Power Screen Min capacity – 60t/hr.	1			
2	B) Bituminous Plants				
	1. Bitumen Pressure distributor	1			
	2. Self-propelled chip spreader	1			
		1			
	3. Asphalt Plant				
		1			
	4. Pavers				
3	C) Compactors				

Item No.	Equipment Details	*Minimum Number Required for the Contract Execution	No of Equipment Owned by the Bidder	No. of equipment to be hired/ purchased by the Bidder	No. of equipment to be made available for the Contract by the Bidder
4	1. Vibrating compaction plate 300 mm wide	1			
	2. Vibrating compaction plate 600 mm wide	2			
	D) Mobile Compressors	2			
	1. Single tool (1.8 m ³ /min)	1			
5	2. Two tool (2.8 – 7.3 m ³ /min)	1			
	E) Concrete Equipment	1			
	1. Mobile concrete mixers	1			
	2. Concrete vibrators				
	F) Transport (Tippers, dumpers, water tankers)	2			

Item No.	Equipment Details	*Minimum Number Required for the Contract Execution	No of Equipment Owned by the Bidder	No. of equipment to be hired/ purchased by the Bidder	No. of equipment to be made available for the Contract by the Bidder
6	1. 4X2 tippers payload 7 – 12 tonnes	6			
	2. 6X4 tippers payload 16 – 20 tonnes	3			
		1			
	3. Flat bed lorries				
7	4. Water tankers (18,000 – 20,000 lits capacity)	2			
	G) Earth – Moving Equipment				
	1. Tractor dozers with dozer attachment (D6-D9 equivalent)	1			
		1			
	2. Tractor loaders	2			
	3. Wheeled loaders	2			
8	4. Motor graders (93 - 205kW)				
	5. Trench excavator	2			

Item No.	Equipment Details	*Minimum Number Required for the Contract Execution	No of Equipment Owned by the Bidder	No. of equipment to be hired/ purchased by the Bidder	No. of equipment to be made available for the Contract by the Bidder
9	H) Diesel Generators 1. Diesel generators (15 – 200Kva)				
10	I) Excavators 1. Hydraulic crawler mounted (7 – 16 tonnes) – 0.25 – 0.6 m3 SAE bucket.	1			
	J) Rollers 1. Self-propelled single drum vibrating (various types)	2			
	2. Pneumatic rubber tyre (1-2 tonnes/wheel)	2			
	3. Sheep's foot roller	1			
	4. Double drum vibrating roller				

All lease agreements must be current (within six months from the date of tender opening).
Noncompliance will lead to disqualification.

We hereby certify that notwithstanding the list of plant detailed above, we will provide
sufficient, suitable and adequate plant in good working order for the successful completion
of works

.....

(Signature of Contractor)

.....

(Date)

SECTION 7: CONDITIONS OF CONTRACT

SECTION 6A - CONDITIONS OF CONTRACT PART I: GENERAL CONDITIONS OF CONTRACT

The Conditions of Contract, Part I: General Conditions shall be those forming Part I of the “Conditions of Contract for Works of Civil Engineering Construction,” first edition 1999, prepared by the *Fédération Internationale des Ingénieurs-Conseils* (FIDIC). These Conditions are subject to the variations and additions set out in Part II hereof entitled “Conditions of Particular Application.”.

Copies of the FIDIC Conditions of Contract can be obtained from:

FIDIC Secretariat
P.O. Box 86
1000 Lausanne 12
Switzerland
Facsimile: 41 21 653 5432
Telephone: 41 21 653 5003

CONDITIONS OF CONTRACT PART II (CONDITIONS OF PARTICULAR APPLICATION)

The following Conditions of Particular Application shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of Contract. The Particular Condition is preceded by the corresponding clause number of the General Conditions to which it relates.

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SUB CLAUSE 1.1 – DEFINITIONS

Amend this sub-clause as follows:

- (a) (i) The “Employer” is the Kenya Urban Roads Authority, represented by the Director General - Kenya Urban Roads Authority.
- (ii) The “Engineer” is the General Manager (Design & Construction) - Kenya Urban Roads Authority.
- .
- (b) (i) Insert in line 2 after the Bills Of Quantities”, the following, “the rates entered by the Contractor (whether or not such rate be employed in computation of the Contract Price),”

Amend subparagraph (b) (v) of Sub-Clause 1.1 by adding the following words at the end:

The word “BID” is synonymous with “Tender” and the word “Appendix to BID” with “Appendix to Tender” and the word “BID documents” with “Tender documents”.

Add the following at the end of this sub-clause:

- (h) (i) “Materials” means materials and other things intended to form or forming part of the Permanent Works.

SUB CLAUSE 2.1 - ENGINEER’S DUTIES AND AUTHORITY.

With reference to Sub-Clause 2.1 (b), the following shall also apply: The Engineer shall obtain the specific approval of the Employer before taking any of the following actions specified in Part 1:

- (a) Consenting to the subletting of any part of the works under Clause 4;
- (b) Certifying additional cost determined under Clause 12;
- (c) Determining an extension of time under Clause 44;
- (d) Issuing a variation under Clause 51;
- (e) Fixing rates or prices under Clause 52

SUB CLAUSE 5.1 - LANGUAGE AND LAW

The Contract document shall be drawn up in the ENGLISH LANGUAGE. Communication between the Contractor and the Engineer’s Representative shall be in this given language.

- (a) The Laws applicable to this Contract shall be the Laws of the Republic of Kenya.

SUB CLAUSE 5.2 – PRIORITY OF CONTRACT DOCUMENTS

Delete the documents listed 1-6 and substitute:

- (1) The Contract Agreement (if completed)
- (2) The Letter Of Acceptance;

- (3) The form of Bid and Appendix to the form of Bid;
- (4) The Conditions of Contract Part II;
- (5) The Conditions of Contract Part I;
- (6) The Special Specifications;
- (7) The Standard Specification for Road and Bridge Construction, 1986;
- (8) The Drawings;
- (9) The priced Bills of Quantities
- (10) Other documents as listed in the Appendix to form of Bid

SUB CLAUSE 10.1 ~ PERFORMANCE SECURITY

Replace the text of Sub-clause 10.1 with the following:

“The Contractor shall provide security for his proper performance of the Contract within 21 days after receipt of the Letter of Acceptance. The Performance Security shall be in the form of a bank guarantee as stipulated by the Employer in the Appendix to Bid. The Performance Security shall be issued by a bank incorporated in Kenya. The Contractor shall notify the Engineer when providing the Performance Security to the Employer.

“Without limitation to the provisions of the preceding paragraph, whenever the Engineer determines an addition to the Contract Price as a result of a change in cost, the Contractor, at the Engineers written request, shall promptly increase the value of the Performance Security by an equal percentage.

SUB CLAUSE 10.2 ~ VALIDITY OF PERFORMANCE SECURITY

The Performance Security shall be valid until a date 28 days after the date of issue of the Defects Liability Certificate. The security shall be returned to the Contractor within 14 days of expiration.

SUB CLAUSE 10. 3 ~ CLAIMS UNDER PERFORMANCE SECURITY

Delete the entire sub-clause 10.3.

SUB CLAUSE 10. 4 ~ COST OF PERFORMANCE SECURITY

The cost of complying with the requirements of this clause shall be borne by the Contractor.

SUB CLAUSE 11. 1 ~ INSPECTION OF SITE

In line 17 after “affect his BID” add

“and the Contractor shall be deemed to have based his BID on all the aforementioned”

Delete the last paragraph completely and replace with the following:

“The Employer in no way guarantees completeness nor accuracy of the soil, materials, subsurface and hydrological information made available to the Contractor at the time of bidding or at any other time during the period of the Contract, and the Contractor shall be responsible for ascertaining for himself all information as aforesaid for the execution of works and his BID shall be deemed to have been priced accordingly.

SUB CLAUSE 11.2 ~ ACCESS TO DATA

Data made available by the Employer in accordance with Clause 11.1 shall be deemed to include data listed elsewhere in the Contract as open for inspection at the address stipulated in the Appendix to Bid.

SUB CLAUSE 14.1 PROGRAM TO BE SUBMITTED

The time within which the program shall be submitted shall be as specified in the Appendix to the Form of Bid.

This detailed program shall be based upon the program submitted by the Contractor as part of his BID, where this was required, and shall in no material manner deviate from the said program.

The program shall be in the form of a Critical Path Method Network (CPM Network) showing the order of procedure and a description of the construction methods and arrangements by which the Contractor proposes to carry out the works. It should also be supplemented by a time –bar chart of the same program. The program shall be coordinated with climatic, groundwater and other conditions to provide for completion of the works in the order and by the time specified. The program shall be revised at three-month intervals and should include a chart of the principle quantities of work forecast for execution monthly.

The Contractor shall submit to the Engineer not later than the day or date mentioned in the Appendix to the Form of Bid, a general description of his proposed arrangements and methods for the execution of the Works, including temporary offices, buildings, access roads, construction plant and its intended production output, working shift arrangements, labour strength, skilled and unskilled, supervision arrangements, power supply arrangements, supply of materials including a materials utilization program, stone crushing, aggregate production and storage, cement handling, concrete mixing and handling, methods of excavation, dealing with water, testing methods and facilities.

During the execution of the works, the Contractor shall submit to the Engineer full and detailed particulars of any proposed amendments to the arrangements and methods submitted in accordance with the foregoing.

If details of the Contractors proposals for Temporary Works are required by the Engineer for his own information the Contractor shall submit such details within fourteen days of being requested to do so.

The various operations pertaining to the works shall be carried out in such a progressive sequence as will achieve a continuous and consecutive output of fully completed roadworks inclusive of all bridge works and culverts within the time limits specified in the Contract. Generally the Contractor shall start at one end of the road and progress continuously towards the other without leaving any isolated section or sections of uncompleted road provided always that the site of the works has been acquired in its entirety and the encumbrances and services thereon removed.

The Contractor shall allow in his programme for the following public holidays per calendar year during which the Contractor shall not be permitted to work.

- New Year's Day (1st January)
- Good Friday
- Easter Monday
- Labour day (1st May)
- Madaraka Day (1st June)
- Idd Ul Fitr
- Mashujaa Day (20th October)
- Jamhuri day (12th December)
- Christmas Day (25th December)
- Boxing day (26th December)

The Contractor shall also allow per calendar year for a further 2 unspecified public holidays which may be announced by the Government of Kenya with no prior notification upon which he shall not be permitted to work.

SUB CLAUSE 14.3- CASH FLOW ESTIMATE

The time within which the detailed cash flow estimate shall be submitted shall be as specified in the Appendix to the Form of Bid.

SUB CLAUSE 15.1- CONTRACTOR'S SUPERINTENDENCE

Add the following at the end of the first paragraph of sub-clause 15.1:

"The Contractor shall, within seven (7) days of receipt of the Engineer's order to commence the works inform the Engineer in writing the name of the Contractor's Representative and the anticipated date of his arrival on site."

Add the following Sub-clause 15.2

SUB CLAUSE 15.2- LANGUAGE ABILITY AND QUALIFICATIONS OF CONTRACTOR'S AUTHORISED AGENT

The Contractor's Agent or Representative on the site shall be a Registered Engineer as registered by the Engineer's Registration Board of Kenya in accordance with the Laws Of Kenya Cap 530 or have equivalent status approved by the Engineer and shall be able to read and write English fluently.

The Contractor's Agent or Representative shall have at least 10 years' experience as an Engineer.

SUB CLAUSE 16.2- ENGINEER AT LIBERTY TO OBJECT

At the end of this Clause add

"by a competent substitute approved by the Engineer and at the Contractors own expense."

Add the following Sub-Clauses 16.3 and 16.4:

SUB CLAUSE 16.3- QUALIFICATION AND LANGUAGE ABILITY OF SUPERINTENDING STAFF

The Contractor's superintending staff shall meet the following minimum qualifications:

Should have a working knowledge of English or Kiswahili. Should any of the superintending staff not be able to meet this condition, the Contractor shall propose to the Engineer arrangements for provision of a sufficient number of interpreters of approved qualifications. The Engineer, at his discretion, may amend, approve or reject such arrangements or reject deployment of superintending staff not meeting the language requirements. The Engineer may at any time during the duration of the Contract amend any approved arrangements made for interpreters, which shall be implemented at the Contractors expense.

The key staff listed below must have minimum experience and academic qualifications from government recognised institutions or equivalent institutions of the levels set out in Section 5, Part 6.

- Site Agent
- Site Surveyor
- Foremen

Qualifications as above shall be subject to verification and approval on site by the Engineer or his representative on site before commencement of the said works.

SUB CLAUSE 16.4 – EMPLOYMENT OF LOCAL PERSONNEL

The Contractor is encouraged, to the extent practicable and reasonable, to employ staff and labour with appropriate qualifications and experience who are Kenya citizens.

SUB CLAUSE 19.1- SAFETY, SECURITY AND PROTECTION OF THE ENVIRONMENT

Add Sub-Clause-paragraph (d) of Sub-Clause 19 as follows:

Notwithstanding the Contractor's obligation under Sub-Clause-paragraph (a), (b) and 9(c) of Sub-Clause 19.1 of the Conditions of Contract, the Contractor shall observe the following measures with a view to reducing or elimination adverse environmental effects by the site works:

- (i) All quarries and borrow pits shall be filled and landscaped to their original state after extraction of construction material
- (ii) Soil erosion due to surface runoff or water from culverts or other drainage structures should be avoided by putting in place proper erosion control measures that shall include, but are not limited to grassing and planting if trees
- (iii) Long traffic diversion roads shall be avoided so as to minimize the effect of dust on the surrounding environment. In any case all diversions shall be kept damp and dust free
- (iv) Spillage of oils, fuels and lubricants shall be avoided and if spilt, shall be collected and disposed off in such a way as not to adversely affect the environment
- (v) Rock blasting near settlement areas shall be properly coordinated with the relevant officers of the Government so as to minimize noise pollution and community interference.

SUB CLAUSE 20.4 - EMPLOYERS RISKS

Delete Sub-Clause (h) and substitute with;

(h) any operation of the forces of nature (insofar as it occurs on site) which an experienced contractor:

- (i) could not have reasonably foreseen, or
- (ii) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:
 - (A) prevent loss or damage to physical property from occurring by taking appropriate measures or
 - (B) insure against such loss or damage

SUB CLAUSE 21.1 ~ INSURANCE OF WORKS AND CONTRACTOR 'S EQUIPMENT

Add the following words at the end of Sub-paragraph (a) and immediately before the last word of Sub-paragraph (b) of Sub-Clause 21.1:

“It being understood that such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred”

Delete the first sentence of this Clause and replace with the following:

“prior to commencement of the Works the Contractor shall, without limiting his or the Employer’s obligations and responsibilities under Clause 20, insure to the satisfaction of the Employer.”

SUB CLAUSE 21.2 – SCOPE OF COVER

Amend sub-paragraph (a) of Sub-Clause 21.2 as follows:

Delete words “from the start of work at the site” and substitute the words “from the first working day after the Commencement Date”

Add the following as Sub-Clause (c) under Sub-Clause 21.2

(c) It shall be the responsibility of the Contractor to notify the insurance company of any change in the nature and extent of the Works and to ensure the adequacy of the insurance coverage at all times during the period of the Contract.

SUB CLAUSE 21.4 ~ EXCLUSIONS

Amend Sub-Clause 21.4 to read as follows:

“There shall be no obligation for the insurances in Sub-Clause 21.1 to include loss or damage caused by the risks listed under Sub-Clause 20.4 sub-paragraph (a) (i) to (iv) of the Conditions of Particular Application.”

SUB CLAUSE 23.2 – MINIMUM AMOUNT OF INSURANCE

Add the following at the end of this Clause:

“ with no limits to the number of occurrences”.

SUB CLAUSE 25.1 – EVIDENCE AND TERMS

Amend Sub-Clause OF INSURANCE 25.1 as follows:

Insert the words “as soon as practicable after the respective insurances have been taken out but in any case” before the words “prior to the start of work at the site”

Add the following Sub-Clauses 25.6, 25.7

SUB CLAUSE 25.6 – INSURANCE NOTICES

Each policy of insurance effected by the Contractor for purposes of the Contract shall include a provision to the effect that the Insurer shall have a duty to give notice in writing to the Contractor and Employer of the date when a premium becomes payable. This shall not be more than thirty (30)

days before that date and the policy shall remain in force until thirty (30) days after the giving of such notice.

SUB CLAUSE 25.7 – NOTIFICATION TO INSURERS

It shall be the responsibility of the Contractor to notify insurers under any of the insurance referred to in the preceding clauses 21, 23 and 24 on any matter or event, which by the terms of such insurance are required to be so notified. The Contractor shall indemnify and keep indemnified the Employer against all losses, claims, demands, proceedings, costs, charges and expenses whatsoever arising out of or in consequence of any default by the Contractor in complying with the requirements of this Sub-Clause whether as a result of avoidance of such insurance or otherwise.

SUB CLAUSE 28.2 – ROYALTIES

Add at the end of this Sub-Clause the following sentence:

“The Contractor shall also be liable for all payments or compensation if any that are levied in connection with the dumping of part or all of any such material.”

SUB CLAUSE 29.1 – INTERFERENCE WITH TRAFFIC

Supplement Sub-Clause 29.1 by adding the following sentence at the end:

“The Contractor will be permitted to use existing public roads for access to the site. The Contractor shall pay vehicle license tax and road maintenance duty in accordance with relevant regulations and shall obtain any necessary permits or licenses from relevant authorities for transporting his equipment.”

Add the following Sub clause 29.2:

SUB CLAUSE 29.2 – REINSTATEMENT AND COMPENSATION FOR DAMAGES TO PERSONS AND PROPERTY

The Contractor shall reinstate all properties whether public or private which are damaged in consequence of the construction and, maintenance of the works to a condition as specified and at least equal to that prevailing before his first entry on them.

If in the opinion of the Engineer the Contractor shall have failed to take reasonable and prompt action to discharge his obligations in the matter of reinstatement, the Engineer will inform the Contractor in writing of his opinion, in which circumstances the Employer reserves the right to employ others to do the necessary work of reinstatement and to deduct the cost thereof from any money due or which shall become due to the Contractor.

The Contractor shall refer to the Employer without delay all claims which may be considered to fall within the provisions of Clause 22.1.

Add the following Sub-Clause 34.2 to 34.8

SUB CLAUSE 34.2 – CONDITIONS OF EMPLOYMENT OF LABOUR

The Contractor shall be responsible for making all arrangements for and shall bear all costs relating to recruitment, obtaining of all necessary visas, permits or other official permission for movements of staff and labour.

SUB CLAUSE 34.3 – FAIR WAGES

The Contractor shall, in respect of all persons employed anywhere by him in the execution of the Contract, and further in respect of all persons employed by him otherwise than in the execution of the Contract in every factory, Workshop or place occupied or used by him for the execution of the Contract, observe and fulfil the following conditions:

- (a) The Contractor shall pay rates of wages, observe hours of labour and provide conditions of labour, housing, amenities and facilities not less favourable than those required by the latest Regulation of Wages (Building and Construction Industry) Order as of the time of bid submission, and subsequent amendments thereto, or in any wage scales, hours of work or conditions agreed by the Ministry of Labour or other Government Department in consultation with the appropriate wage fixing authority and generally recognized by other employees in the district whose general circumstances in the trade or industry in which the Contractor is engaged are similar.
- (b) In the absence of any rates of wages, hours or conditions of labour so established the Contractor shall pay rates of wages and observe hours and conditions of labour which are not less favourable than the general level of wages, hours and conditions observed by other Employers whose general circumstances in the trade or industry in which the Contractor is engaged are similar.
- (c) Where the absence of established rates of wages, hours and conditions of labour or the dissimilarity of the general circumstances in the trade of industry in which the Contractor is engaged prevent the Contractor from observing rates of wages, hours and conditions of labour ascertained under sub-paragraph (a) and (b) above the Contractor in fixing the rates of wages, hours and conditions of labour of his employees shall be guided by the advice of the Labour Department.
- (d) The Contractor shall recognize the freedom of his employees to be members of trade unions.
- (e) The Contractor shall maintain records in English of the time worked by, and the wages paid to, his employees. The Contractor shall furnish to the Engineer or Employer, if called upon to do so, such particulars of the rates, wages and conditions of labour as the Employer or Engineer may direct.

(f) The Contractor shall at all times during the continuance of the contract display, for the information of his employees in every factory, workshop or place occupied or used by him for the execution of the Contract, a copy of this clause together with a notice setting out the general rates of wages, hours and conditions of labour of his employees.

(g) The Contractor shall be responsible for the observance of this clause by sub-Contractors employed in the execution of the works.

SUB CLAUSE 34.4 – BREACH OF FAIR WAGES CLAUSE

Any Contractor or Sub-Contractor who is found to be in breach of Fair Wages Clause shall cease to be approved as a Contractor or Sub-Contractor for such period as the Permanent Secretary for the Ministry of Roads and Public Works may determine.

Should a claim be made to the Employer alleging the Contractor's default in payment of Fair Wages of any workman employed on the Contract and if proof thereof satisfactory to the Employer is furnished by the Labour Authority, the Employer may, failing payment by the Contractor, pay the claims out of any monies due or which may become due to the Contractor under the Contract.

SUB CLAUSE 34.5 – RECRUITMENT OF UNSKILLED LABOUR

Any additional unskilled labour which is required by the Contractor for the works and which is not in his employ at the time of the acceptance of the BID shall be recruited by the Contractor from the Labour Exchange or Exchange or Exchanges nearest to the site or sites of the work.

SUB CLAUSE 34.6 – COMPENSATION FOR INJURY

The Contractor shall in accordance with the Workmen's Compensation Act of the Laws of Kenya and any other regulations in force from time to time pay compensation for loss or damage suffered in consequence of any accident or injury or disease resulting from his work to any workman or other person in the employment of the Contractor or any Subcontractor.

SUB CLAUSE 34.7 – LABOUR STANDARDS

(a) The Contractor shall comply with the existing local labour laws, regulations and labour standards

(b) The Contractor shall formulate and enforce an adequate safety program with respect to all work under his contract, whether performed by the Contractor or subcontractor. The Contractor has assurance from the Employer of cooperation where the implementation of these safety measures requires joint cooperation.

(c) Upon written request of the Employer the Contractor shall remove or replace any of his employees employed under this Contract.

Add the following Sub-Clause 35.2 and 35.3.

SUB CLAUSE 35.2 – RECORDS OF SAFETY AND HEALTH

The Contractor shall maintain such records and make such reports concerning safety, health and welfare of persons and damage to property as the Engineer may from time to time prescribe.

SUB CLAUSE 35.3 – REPORTING OF ACCIDENTS

The Contractor shall report to the Engineer details of any accident as soon as possible after its occurrence. In the case of any fatality or serious accident, the Contractor shall, in addition, notify the Engineer immediately by the quickest available means. The Contractor shall also notify the relevant authority whenever the Laws of Kenya require such a report.

SUB CLAUSE 41.1 – COMMENCEMENT OF WORKS

Amend Sub-Clause 41.1 as follows:

Delete the words “as soon as is reasonably possible” in the first sentence and replace with “within the period stated in the Appendix to Bid”.

SUB CLAUSE 43.1 – TIME FOR COMPLETION

Amend Sub-Clause 43.1 as follows:

Delete the words “within the time” to “such extended time” and substitute “by the date or dates stated or implied in Clause 14 of these Conditions of Particular Application.

SUB CLAUSE 44.1 – EXTENSION OF TIME FOR COMPLETION

Add at the end of Sub-Clause 44.1 the following:

“Neither rains falling within the rainy seasons as occurs in Kenya nor floods caused by such rains shall be deemed exceptional weather conditions such as may fairly entitle the Contractor to an extension of time for the completion of the work.”

SUB CLAUSE 45.1 – RESTRICTION ON WORKING HOURS

Add at the end of Sub-Clause 45.1 the following:

“If the Contractor requests permission to work by night as well as by day, then if the Engineer shall grant such permission the Contractor shall not be entitled to any additional payments for so doing. All such work at night shall be carried out without unreasonable noise or other disturbance and the Contractor shall indemnify the Employer from and against any liability for damages on account of noise or other disturbance created while or in carrying out night work and from and against all claims, demands, proceedings, costs, charges and expenses whatsoever in regard or in relation to such liability.

“In addition the Contractor will be required to provide, for any work carried out at night or recognized days of rest, adequate lighting and other facilities so that the work is carried out safely and properly.

“In the event of the Engineer granting permission to the Contractor to work double or rotary shifts or on Sundays, the Contractor shall be required to meet any additional costs to the Employer in the administration and supervision of the Contract arising from the granting of this permission.”

SUB CLAUSE 47.2 – REDUCTION OF LIQUIDATED DAMAGES

Add the following paragraphs at the end of this Sub-Clause:

“There shall be no reduction in the amount of liquidated damages in the event that a part or a section of the Works within the Contract is certified as completed before the whole of the Works comprising that Contract.

The Employer shall pay no bonus for early completion of the Works to the Contractor.

The sum stated in the Appendix to Bid as liquidated damages shall be increased by a sum equivalent to any additional amount payable by the Employer to the Contractor under clause 70.1 in respect of an increase in costs in such a period that would not have been incurred by the Contractor if the works had been completed by the due date for completion prescribed by Clause 43.”

SUB CLAUSE 52.1 – VALUATION AND VARIATIONS

Add new Clause 52.2(c)

No change in the unit rates or prices quoted shall be considered for items included in the schedule of Dayworks rates, or Provisional Sums and items, or for any item in the BOQ.

Modification to Clause 52(3)

SUB CLAUSE 52.4 – DAYWORKS

Add the following at the end of Sub-Clause 52.4:

The work so ordered shall immediately become part of the works under the contract. The Contractor shall, as soon as practicable after receiving the Dayworks order from the Engineer undertake the necessary steps for due execution such work. Prior to commencement of any work to be done on a

Dayworks basis, the Contractor shall give an advance notice to the Engineer stating the exact time of such commencement.

SUB CLAUSE 54.1 – CONTRACTOR'S EQUIPMENT, TEMPORARY WORKS AND MATERIALS

: Exclusive use for the works

Amend Sub-Clause 54.1 as follows:

Line 5: add "written" between "the" and "consent".

Delete Sub-Clauses 54.2 and 54.5.

SUB CLAUSE 55.2 – OMISSIONS OF QUANTITIES

Items of Works described in the Bills of Quantities for which no rate or price has been entered in the Contract shall be considered as included in other rates and prices in the Contract and will not be paid for separately by the Employer.

Add the following Sub-Clause 58.4:

SUB CLAUSE 58.4 – PROVISIONAL ITEMS

Provisional items shall be read as Provisional Sums and shall be operated as such in accordance with Sub-Clauses 58.1 to 58.3.

Clause 60 of the General Conditions is deleted and substituted with the following:-

SUB CLAUSE 60.1 – MONTHLY STATEMENT

The Contractor shall submit a statement to the Engineer at the end of each month, in a tabulated form approved by the Engineer, showing the amounts to which the Contractor considers himself to be entitled. The statement shall include the following items, as applicable;

- ~ The value of the Permanent Work executed up to the end of previous month
- ~ such an amount (not exceeding 75 percent of the value) as the Engineer may consider proper on account of materials for permanent work delivered by the Contractor in the site
- ~ such amount as the Engineer may consider fair and reasonable for any Temporary Works for which separate amounts are provided in the Bill of Quantities
- ~ adjustments under Clause 70
- ~ any amount to be withheld under retention provisions of Sub-clause 60.3
- ~ any other sum to which the Contractor may be entitled under the Contract

If the Engineer disagrees with or cannot verify any part of the statement, the Contractor shall submit such further information as the Engineer may reasonably require and shall make such changes and

corrections in the statement as may be directed by the Engineer. In cases where there is difference in opinion as to the value of any item, the Engineer's view shall prevail.

SUB CLAUSE 60.2 INTERIM PAYMENT CERTIFICATE

The Contractor shall forward to the Engineer an Interim Payment Certificate based on the statement as corrected above and, should it be necessary in the Engineers opinion, shall promptly make any further amendments and corrections to the Interim Payment Certificate.

The Engineer shall not unreasonably withhold certifying an Interim Payment Certificate and in case of likely delay in establishing the value of an item, such item may be set aside and the remainder certified for payment.

Within 28 days after receipt of the Interim Payment Certificate and subject to the Contractor having made such further amendments and corrections as the Engineer may require, the Engineer will forward to the Employer the certified Interim Payment Certificate.

Provided that the Engineer shall not be bound to certify any payment under this Clause if the net amount thereof, after all retentions and deductions, would be less than the minimum amount of Interim Payment Certificate's stated in the Appendix to Form of Bid. However in such a case, the uncertified amount will be added to the next interim payment, and the cumulative unpaid certified amount will be compared to the minimum amount of interim payment.

SUB CLAUSE 60.3 – PAYMENT OF RETENTION MONEY

A retention amounting to the percentage stipulated in the Appendix to Bid shall be made by the Engineer in the first and following Interim Payment Certificates until the amount retained shall reach the "Limit of Retention Money" named in the Appendix to Form of BID.

Upon the issue of the Taking-Over Certificate, with respect to the whole of the works one half of the retention money shall become due and shall be paid to the Contractor when the Engineer shall certify in writing that the last section of the whole works has been substantially completed.

Upon expiration of the Defects Liability Period for the works, the other half of the Retention Money shall be certified by the Engineer for payment to the Contractor.

Provided that in the event of different Defects Liability Periods being applicable to different Sections of the Permanent Works pursuant to Clause 48, the expression "expiration of the Defects Liability Period " shall, for the purpose of this sub-clause, be deemed to mean the expiration of the latest of such periods.

Provided also that if at such time, there remain to be executed by the Contractor any work instructed, pursuant to Clause 49 and 50, in respect of the works, the Engineer shall be entitled to withhold

certification until completion of any such work or so much of the balance of the Retention money as shall in the opinion of the Engineer, represents the cost of the remaining work to be executed.

SUB CLAUSE 60.4– CORRECTION OF CERTIFICATES

The Engineer may in any Interim Payment Certificate make any correction or modification to any previous Interim Payment Certificate signed by him and shall have authority, if any work is not being carried out to his satisfaction to omit or reduce the value of such work in any Interim Payment Certificate.

SUB CLAUSE 60.5– STATEMENT AT COMPLETION

Not later than 84 days after the issue of the Taking-Over Certificate in respect of the whole of the works, the Contractor shall submit to the Engineer a statement at completion showing in detail, in a form approved by the Engineer;

The final value of all work done in accordance with the Contract up to the date stated in such Taking-Over Certificate.

Any further sums which the Contractor considers to be due; and

An estimate of amounts that the Contractor considers will become due to him under the Contract.

Estimate amounts shall be shown separately in the Statement at Completion. The Contractor shall amend and correct the Statement as directed by the Engineer and submit a Certificate at Completion to be processed as in Sub-Clause 60.2.

SUB CLAUSE 60.6 – FINAL STATEMENT

Not later than 56 days after the issue of the Defects Liability Certificate pursuant to Sub-Clause 62.1, the Contractor shall submit to the Engineer for consideration a draft final statement with supporting documents showing in detail, in the form approved by the Engineer;

The final value of all work done in accordance with the Contract;

Any further sums which the Contractor considers to be due to him.

If the Engineer disagrees with or cannot verify any part of the draft final statement, the Contractor shall submit such further information as the Engineer may reasonable require and shall make such changes in the draft as may be required.

SUB CLAUSE 60.7– DISCHARGE

Upon submission of the Final Statement, the Contractor shall give to the Employer, with a copy to the Engineer, a written discharge confirming that the total of the Final statement represents full and final settlement of all monies due to the Contractor arising out of or in respect of the Contract. Provided that such discharge shall become effective only after payment under the Final Payment Certificate issued pursuant to Sub-Clause 60.8 has been made and the Performance Security referred to in Sub-Clause 10.1 has been returned to the Contractor.

SUB CLAUSE 60.8 – FINAL PAYMENT CERTIFICATE

Upon acceptance of the Final Statement as given in Sub-Clause 60.6, the Engineer shall prepare a Final Payment Certificate which shall be delivered to the Contractor's authorized agent or representative for his signature. The Final Payment Certificate shall state:

The final value of all work done in accordance with the Contract;

After giving credit to the Employer for all amounts previously paid by the Employer, the balance, if any, due from the Employer to the Contractor or the Contractor to the Employer.

Final Certificate shall be issued for any sum due to the Contractor even if such is less than the sum named in the Appendix to the Form of BID.

SUB CLAUSE 60.9– CESSATION OF EMPLOYERS LIABILITY

Unless the Contractor notifies the Engineer of his objection to the Final Certificate within fourteen days of delivery thereof he shall be deemed to have agreed that he accepts the total Contract Price as set out in the Final Certificate as full settlement for all Work Done under the Contract including any variations and omissions thereof but excluding any variations and claims previously made in writing.

SUB CLAUSE 60.10 – TIME FOR PAYMENT

The amount due to the Contractor under any Interim Payment Certificate or Final Payment Certificate issued pursuant to this Clause or to any other term of the Contract, shall, subject to Clause 47, be paid by the Employer to the Contractor as follows:

- (i) In the case of Interim Payment Certificate, within the time stated in the Appendix to Form Of Bid, after the Engineer has signed the Interim Payment Certificate.
- (i) In the case of the Final Payment Certificate pursuant to Sub clause 60.8, within the time stated in the Appendix to Form Of Bid, after the Engineer has signed the Final Payment Certificate.

- (ii) In the event of the failure of the Employer to make payment within the times stated, the Employer shall make payment to the Contractor of simple interest at a rate equal to two percentage points above the averaged Base Lending Rate of three leading banks namely Kenya Commercial Bank, Standard Chartered Bank and Barclays Bank for the time being or as shall be the case from the time to time obtained from the Central Bank of Kenya. The provisions of this Sub clause are without prejudice to the Contractor's entitlements under Clause 69 or otherwise.

SUB CLAUSE 60.11 – CURRENCY OF PAYMENT

The Contract Price shall be designated in Kenyan Currency.

All work performed by the Contractor under the Contract shall be valued in Kenya Shillings using the rates and prices entered in the Bills of Quantities together with such other increases to the Contract Price, except for variation of price payments in accordance with Clause 70.1.

SUB CLAUSE 60.12 – ADVANCE PAYMENT

Advance payment shall not be offered in this Contract.

SUB CLAUSE 60.13 MATERIALS FOR PERMANENT WORKS

With respect to materials brought by the Contractor to the site for incorporation into the permanent works, the Contractor shall,

- Receive a credit in the month in which these materials are brought to site,
 - Be charged a debit in the month in which these materials are incorporated in the permanent works.
- Both such credit and debit to be determined by the Engineer in accordance with the following provisions.

No credit shall be given unless the following conditions shall have been met to the Engineers satisfaction

The materials are in accordance with the specifications for the works;

The materials have been delivered to site and are properly stored and protected against loss, damage or deterioration;

The Contractors record of the requirements, orders receipts and use of materials are kept in a form approved by the Engineer, and such records are available for inspection by the Engineer;

The Contractor has submitted a statement of his cost of acquiring and delivering the materials and plant to the Site, together with such documents as may be required for the purpose of evidencing such cost;

The materials are to be used within a reasonable time.

The amount to be credited to the Contractor shall not be more than 75% of the Contractor's reasonable cost of the materials delivered to site, as determined by the Engineer after review of the documents listed in subparagraphs (a) (iv) above;

The amount to be debited to the Contractor for any materials incorporated into the works shall be equivalent to the credit previously granted to the Contractor for such materials pursuant to Clause (b) above as determined by the Engineer.

SUB CLAUSE 67.1 – ENGINEER'S DECISION

Delete the entire Sub clause 67.1 and add the following;

“If a dispute of any kind whatsoever arises between the Employer and the Contractor in any connection with, or arising out of, the Contract or the execution of the works, whether during the execution of the works or after their completion and whether before or after repudiation or other termination of the Contract including any dispute as to any opinion, instruction, determination, certificate or valuation of the Engineer, the matter in dispute shall, in the first place, be referred in writing to the Engineer, with a copy to the other party. Such reference shall state it is made pursuant to this clause. No later than 28 (twenty eight) day after the day on which he received such reference the Engineer shall give notice of his decision to the Employer and the Contractor. Such decision shall state it is made pursuant to this clause.

Unless the Contract has already been repudiated or terminated, the Contractor shall, in every case, continue to proceed with the works with all due diligence and the Contractor and the Employer shall give effect forthwith to every such decision of the Engineer unless and until the same shall be revised, as hereinafter provided, in an Amicable Settlement, Adjudicator's or Arbitrator's award.

If either the Employer or the Contractor be dissatisfied with the any decision of the Engineer, or if the Engineer fails to give notice of his decision on or before the 28th (twenty eighth) after the day on which he received the reference, then either the Employer or the Contractor may, on or before the 28th (twenty eighth) day after the day the day on which he received notice of such decision, or on or before the 28th (twenty eighth) day after the day the day on which the said period of 28 days expired, as the case may be, give notice to the other party, with a copy for information to the Engineer, of his intention to commence Adjudication, as hereinafter provided, as to the matter in dispute. Such notice shall establish the entitlement of the party giving the same to commence Adjudication, as hereinafter provided, as to such dispute; no adjudication in respect thereof may be commenced unless such notice is given.

If the Engineer has given notice of his decision as to a matter in dispute to the Employer and the Contractor and no notice of intention to commence adjudication as to such dispute has been given by

either the Employer or the Contractor on or before the twenty eighth day after the day on which the parties received notice as to such decision from the Engineer, the said decision shall become final and binding upon the Employer and the Contractor. “

SUB CLAUSE 67.2 – AMICABLE SETTLEMENT

Delete the entire Sub clause 67.2 and add the following;

“Where notice to of intention to commence adjudication as to a dispute has been in accordance with Sub clause 67.1, the parties shall attempt to settle such dispute amicably before the commencement of Adjudication; provided that, unless the parties otherwise agree, Adjudication may be commenced on or after the 14th (fourteenth) day after the day on which notice of intention to commence adjudication of such dispute was given, even if an attempt at amicable settlement thereto has been made.”

SUB CLAUSE 67.3 – ADJUDICATION

Delete the entire Sub clause 67.3 and add the following;

“The Adjudicator shall be appointed by the Chartered Institute of Arbitrators (Kenya) unless the appointment is agreed by the parties within 7 (seven) days of the notice to adjudication.

The adjudication process shall be conducted according to the Laws of Kenya and the Rules of the Chartered Institute of Arbitrators (Kenya).”

Sub clause 67.3 – ARBITRATION

Delete the entire Sub clause 67.3 and add the following;

“Any dispute in respect of which:

The decision, if any, of the Adjudicator has not become final and binding pursuant to Sub clause 67.1,
and

Amicable settlement has not been reached within the period stated in Sub clause 67.2,

shall be finally settled, under the Laws of Kenya and the Arbitration Rules of the Chartered Institute of Arbitrators (Kenya Branch) by one or more arbitrators appointed by the Chartered Institute of Arbitrators (Kenya Branch).

Neither party shall be limited in the in the proceedings before such arbitrator/s to the evidence or arguments put before the Adjudicator for the purpose of obtaining his said decision pursuant to Sub clause 67.1.

Arbitration may be commenced prior to or after completion of the works, provided that the obligations of the Employer, the Engineer and the Contractor shall not be altered by reason of the arbitration being conducted during the progress of the works.

SUB CLAUSE 68.2 – NOTICES TO EMPLOYER AND ENGINEER

Delete in Sub-Clause 68.2 the words "nominated for that purpose in Part II of these conditions".

The Employer's address is:

**The Director General,
Kenya Urban Roads Authority (KURA),
P.O. Box 41727 - 00100
NAIROBI**

The Engineer's address is:

**General Manager (Design & Construction),
Kenya Urban Roads Authority (KURA),
P.O. Box 41727 - 00100
NAIROBI**

SUB CLAUSE 68.4 – All letters and notices from the Contractor to the Employer and/Engineer must be signed by the Managing Director or the person given written power of Attorney.

CLAUSE 69 – DEFAULT OF EMPLOYER

Delete Sub-Clause 69.1 (c)

In Sub-Clause 69.4 add at the end of first paragraph the following “the period of such suspension shall be as agreed upon by both parties and in any case not more than six (6) months”.

In Sub clause 69.4 of General Conditions of Contract Part I, insert at the end ~~~~“The amounts of such costs which shall be added to the Contract Price shall exclude any cost due to idle time for equipment, plant and labour.”

CLAUSE 70 – CHANGES IN COST AND LEGISLATION

Delete Clause 70 in its entirety, and substitute by 70.1 – 70.8 (inclusive):

70.1 Price Adjustment	“The amounts payable to the Contractor, in various currencies pursuant to Sub-Clause 60.1, shall be adjusted in respect of the rise or fall in the cost of labour, Contractor’s Equipment, Plant, materials, and other inputs to the Works, by comparing the Basic Rates at tendering stage and the current prevailing market prices.
70.2 Other Changes in Cost	To the extent that full compensation for any rise or fall in costs to the Contractor is not covered by the provisions of this or other Clauses in the Contract, the unit rates and prices included in the Contract shall be deemed to include amounts to cover the contingency of such other rise or fall of costs.
70.8 Subsequent Legislation	If, after the date 28 days prior to the latest date for submission of bids for the Contract, there occur in the country in which the Works are being or are to be executed changes to any National or State Statute, Ordinance, Decree, or other Law or any regulation or by-law of any local or other duly constituted authority, or the introduction of any such State Statute, Ordinance, Decree, Law, regulation or by-law which causes additional or reduced cost to the Contractor, other than under the preceding sub-clauses of this clause, in the execution of the Contract, such additional or reduced cost shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be added to or deducted from the Contract Price and the Engineer shall notify the Contractor accordingly, with a copy to the Employer. Notwithstanding the foregoing, such additional or reduced cost shall not be separately paid or credited if the same shall already have been taken into account in any inputs to the Price Adjustment in accordance with the provisions of Sub-Clauses 70.1.

CLAUSE 72 – RATES OF EXCHANGE COST

Delete clause 72 in its entirety and substitute the following:

The currency of BID and payment is Kenya Shillings and rates of exchange requirements are not applicable.

CLAUSE 73 – BRIBERY AND COLLUSION

Add new Clause 73.1:

“The Contractor shall not:

(a) Offer or give or agree to give to any person in the service of the Government of Kenya any gift or consideration or any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other contract to which the Government of Kenya is a party or for showing or forbearing to show favour or disfavour to any person in relation to this or any other contract for the Government of Kenya.

(b) Enter into this or any other contract with the Government of Kenya in connection with which commission has been paid or agreed to be paid by or on his behalf or to his knowledge, unless before the contract is made particulars of any such commission and of the terms and conditions of any agreement for the payment thereof have been disclosed in writing to the Employer.

Any breach of this condition by the Contractor or by anyone employed by him or acting on his behalf (whether with or without the knowledge of the Contractor) or the commission of any offence by the Contractor or by anyone employed by him or acting on his behalf in relation to this or any other contract to which the Government of Kenya is a party shall entitle the Employer to determine the Contract (See Condition 63 hereof) and/ or to recover from the Contractor the amount or value of any such gift, consideration or commission.

Any dispute or difference of opinion arising in respect of either the interpretation, effect or application of this condition or of the amount recoverable hereunder by the Employer from the Contractor shall be decided by the Employer, whose decision shall be final and conclusive.

CLAUSE 74 – CONTRACT CONFIDENTIAL

Add new Clause 74.1:

The Contractor shall treat the details of this Contract as Private and Confidential and shall not publish or disclose the same or any particulars thereof in any trade or technical paper or elsewhere (save in so far as may be necessary for the purpose thereof) without the previous consent in writing of the Government. If any dispute arises as to the necessity of any publication or disclosures for the purposes of this Contract the same shall be referred to the decision of the Engineer mentioned in the said Conditions of Contract whose award shall be final.

SECTION 8: STANDARD SPECIFICATIONS

Standard Specifications refers to the Standard Specifications for Road and Bridge Construction, 1986 Edition

SECTION 9: SPECIAL SPECIFICATIONS

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100 GENERAL

Special Specification is supplementary to the Standard Specification and the two must be read in conjunction. In any case where there appears to be conflict between the two then the Special Specifications will take precedence.

In the absence of any definite provisions on any particular issue in the aforesaid Specifications, reference may be made to the latest codes and specifications of Design Manual for Roads and Bridges of the Ministry of Transport and communication of the Republic of Kenya, Kenya Bureau of Standards (KeBS), BS, ASTM, AASHTO and in that order. Where even these are silent, the construction and completion of the works shall conform to sound engineering practice as approved by the Engineer and in case of any dispute arising out of the interpretation of the above, the decision of the Engineer shall be final and binding on the Contractor.

Where reference is made in the Contract to specific standard codes to be met by the materials, plant, and other supplies to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards as on the date of the bid and codes/design manual in effect shall apply, unless otherwise expressly stated in the contract. Where such standards and codes/design manual are national, or relate to a particular country or region, other internationally recognised standards which ensure a substantially equal or higher performance than the standards and codes/design manual specified will be accepted subject to the Engineer's prior review and written approval. The difference between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Engineer at least 28 days prior to the date when the Contractor desires the Engineer's approval. In the event that the Engineer determines that such proposed deviations do not ensure substantially equal performance, the Contractor shall comply with the standards specified in the documents.

101 Location and Extent of Site

The location of the project is in Ruai area in Kasarani constituency. The project location map is as attached in the book of drawings. The roads provide access to schools and residential homes in Ruai area. The scope is approximately 3Km of access roads. The scope will also include provision of diversion of approximately 2.0Km and provision of drainage structures including a box culvert.

Drawings for these works are provided in Section 11 – Book of Drawings.

Drawings and all relevant details pertaining to the associated works shall be issued during construction of the main works; however, the quantities for these works are incorporated in the Bills of Quantities.

The site of the works shall be within the road reserve and any other places as may be designated in the Construction Contract. The main project works involve the removal of the existing bituminous lanes and/or new construction of new bituminous lanes in order to upgrade the existing roads to a standard dual carriageway for all road sections as shown in the Book of Drawings.

102 Extent of Contract

The major works to be executed under the Contract comprise mainly of but are not limited to the following:

- (i) Site clearance
- (ii) Earthworks to formation level.
- (iii) Pavement Construction as follows:
 - (a) Construction of 300mm subgrade layer
 - (b) Construction of 200mm thick of Hand Packed Stones for sub base and base layer
 - (c) Provision of 50mm thick Asphalt concrete (0-14) wearing course for carriageway and footpaths
- (iv) Drainage and Protection Works
- (v) Road Furniture
- (vi) Street lighting
- (vii) Maintenance of passage of traffic through the works. A Diversion of approximately 2.0Km to bitumen standard to enable continuous flow of traffic
- (viii) Any other activity not listed above but may be deemed necessary and instructed by the Engineer.

102.1 Projects Components

The works proposed in this Contract include but not limited to the following;

- 7.0-meter-wide carriageway
- 2.0m wide footpaths/Cycle tracks;
- Lined drains on either side of the road;
- Road furniture and markings.
- Identification and relocation of services

102.2 Scope of Work

The scope of the work shall include the following:

1. Relocation of utilities as necessary
2. Site clearance
3. Earthworks to formation levels
4. Regular maintenance of passage of traffic during construction including diversion works as necessary to meet regulatory requirements

Construction of the pavement structure as follows:

5. Provision and processing of 300 mm fill of class S4 and compact as improved subgrade as per the cross -section drawings or as instructed by the Engineer to be compacted to 100% MDD (T99)
6. Construction of 200mm thick of Hand Packed Stones for sub base and base layer
7. Provision, spreading and compaction of 50 mm Asphalt Concrete Type 1 wearing course.
8. Construction of pipe culverts, box culverts and other drainage works.
9. Protection works using stone pitching and gabions as necessary.
10. Provision and installation of road furniture including road marking and traffic signs.
11. Maintenance of the works during construction and 12 months Defect Liability Period.
12. Any other activity not listed above but deemed necessary by the Engineer shall be carried out subject to Engineer's formal instructions and within the mode of payment stipulated either by day works or on measured basis.

103 Drawings

This clause shall be read as under:

The drawings provided for bidding purpose shall be as contained in Volume 12 of these Bid documents. The Engineer may from time to time, in order to enable satisfactory completion of works, revise, amend, or supersede any of these drawings. It shall be the Contractor's responsibility to construct the works in conformity with the latest revision and amendment to the drawings provided that the Engineer has given the Contractor in writing such reasonable prior notices of intention to revise, amend, or supersede as the nature of the intended change required and relevant drawings have been issued to the Contractor.

104 Programme for Execution of the Works

The Contractor shall provide the works programme, required under Clause 14.1 of the Conditions of Contract, within 28 days of receipt of the Engineer's Order to commence work.

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

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

The Contractor shall allow in his programme for construction of trial sections and carrying out tests upon them as directed by the Engineer in accordance with the provisions of Clause 129 of the Standard Specification. The time for completion of the Contract shall not be extended because of the time taken to carry out tests and evaluate trial sections.

105 Order of Execution of the Works

In addition to Clause 105 of the Standard Specification, the Contractor shall carry out the Works such that a continuous and consecutive output of fully completed work is achieved. Generally, the Contractor shall commence the works at the beginning of the road package and progress continuously towards the other end without leaving any isolated section or sections of road uncompleted.

107 Certificate of Completion

Wherever the "Certificate of completion" and "Period of Maintenance" are stated in the specification, these shall be read respectively as the "Taking Over Certificate" and "Defects Liability Period".

The Taking-Over Certificate for these works shall be issued upon application by the Contractor under Clause 48.2 of the Conditions of Contract on substantial completion of the construction works. The Defect Liability Certificate will be issued after the end of the Defects Liability Period.

Release of Retention Money will be on issuance of the said certificates.

108 Method of construction

Add the following to this clause:

The submissions of work programme, Order of Work and the General Description of works shall be consistent in presentation and content when handed over for the Engineer's approval and in accordance with programmes and schedules as stated in Clause 14.1 of Conditions of Contract.

Notwithstanding any contrary provision contained in the last paragraph of Clause 108 of the Standard Specification, the Engineer's normal working hours shall be defined as 8:00 a.m. to 5:00 p.m. on weekdays, including lunch break from 1.00 p.m. to 2.00 p.m. and 8:00 a.m. to 1:00 p.m. on Saturdays, with Sunday being set aside as a day of rest. If the contractor wishes to execute permanent works outside these hours, he shall request for and obtain written permission from the Engineer at least one full working day in advance to enable the Engineer to make necessary provision for the supervision of such work. The contractor shall meet any costs arising thereof.

109 Notice of Operations

Name the existing text as 109.1 and add the following:

109.2 Notification Terms

It shall be the Contractor's responsibility to notify the Engineer when any items of the Works scheduled are completed and ready for approval, and the contractor shall give a notice of one full working day to allow control tests to be performed.

117 Health, Safety and Accidents

Insert Sub-clause (i):

In accordance with the laws of Kenya, the Contractor shall make arrangement for awareness programme for public health education and particularly for HIV/AIDS as detailed under Section 26 of this specification.

119 Use of Explosives

Add the following to Clause 119:

The Contractor shall not use explosives without prior written consent of the Engineer. Where the use of explosives is so provided or ordered or authorised, the Contractor shall comply with the requirements of the following beside the law of the land as applicable:

- (a) The Contractor shall at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whatsoever concerned or affected or likely to be concerned or affected by blasting operations.

- (b) The Contractor shall pay all license fees and charges, which may be, required for storage of explosives or in respect of any other matters whatsoever.
- (c) The contractor shall be solely responsible for provision, supply, handling, storage and transportation of all explosive ancillary materials and stores and all other things of every kind whatsoever required for blasting operations and shall not delegate or subcontract these activities without the approval of Engineer.
- (d) Before the beginning of the Defects Liability Period the Contractor shall remove all unused explosives from the site on completion of the Works or which are ordered by the Engineer, and submit to the Engineer written confirmation of compliance with the instruction.
- (e) The Contractor shall submit to the Engineer monthly returns detailing the quantity of explosives brought to the site together with the quantities used during the month and the location and quantity of rock blasted.

120 Protections of Existing Works and Services

Add the following to this Clause:

The cost of determining the location of the existing services together with making good or repairing of any damage caused all to the satisfaction of the Engineer shall be included in the tender rates by the Contractor.

Any damage to, or interference with, existing utilities, caused by the Contractor's operations during the progress of the Works, shall be deemed to be the responsibility of the Contractor who shall undertake to make good at his own expense any damage so caused to the existing underground utilities or other features. The Contractor shall be liable in respect of all claims arising from such damages or interference that may occur.

The Contractor shall be responsible for arranging in liaison with the relevant authorities as soon as the requirements are known for the moving of or alterations to services including power lines, telephone lines, data cables, water mains, sewers and surface water drains which are affected by the works. The arrangements for such moving or alteration shall be subject to the agreement of the Engineer and the relevant authorities.

121 Diversion of services

Add the following to the existing text:

- (a) The Contractor shall acquaint himself with the position of all existing services including sewers, water pipes, underground drains, cable for electricity and telephone lines, telephone and lighting poles before commencing any excavation or other work likely to affect these existing services.
- (b) The Contractor shall pay any charges arising from the moving of such services for which Provisional Sums have been included in the Bill of Quantities. Subject to the agreement of the Engineer and upon production of receipts, the Contractor shall be reimbursed in Interim Certificates the net cost of such moving or alteration plus the percentage inserted in the Bill of Quantities for all costs and profits in making the payments.
- (c) The Contractor shall be entirely responsible for and shall repair at his own cost, any services that may be damaged by his plant, equipment or personnel for not following the laid down procedure of locating and shifting services or damage that may occur subsequent to alteration of such services. The Contractor shall indemnify the Employer against claims arising from damages to existing services or works.

123 Liaison with Government Officials and Police

Add the following to the existing text:

In addition to the requirements of maintaining liaison with Government Officials and Police, the Contractor shall be responsible for acquainting himself with all current and valid ordinances or regulations which may affect the work.

The Contractor's attention is also drawn to his obligations with regard to inspection and examination of the site as stipulated under Clause 11 of the Conditions of Contract.

124 Provision of land

Notwithstanding the provisions of Clause 124 of the Standard Specification, all requirements of land for deviations, quarries, stockpiles, spoil areas and borrow pits when not in the road reserve but required for the construction purposes shall be approved by the Engineer, but the Contractor will make necessary arrangements with the property owners concerned and pay all charges arising thereof on or before completion of the Contract. However, the Employer shall not provide any land for the Quarries, stockpiles, spoil areas and borrow pits and access roads there to.

The Contractor shall remove all temporary works and shall restore all such land to the condition in which it was immediately prior to the occupation thereof as is reasonable and

practicable. No separate payment shall be made to the Contractor on account of these items and the contractor shall make due allowances for them in his rates elsewhere.

Any encroachment of the road reserve, for example by kiosks, shall be brought to the Engineer's attention by the Contractor at the earliest opportunity.

125 Water Supply

Add the following to this clause:

The Contractor at his own cost shall obtain necessary permissions from both relevant Government authorities and private parties to draw water from natural sources and private sources respectively.

127 Information from Exploratory Boring and Test Pits

Delete the contents of Clause 127 and substitute with the following:

- (a) The Materials Report prepared by the Employer does not form part of the bid documents. However, the report will be made available for the Contractor's verification only and any conclusions in regard to suitability of material, location of borrow pits and material quantities made by the Contractor based on this information, will be his own responsibility.
- (b) The Contractor shall allow in his programme for construction of trial sections and carrying out tests upon them as directed by the Engineer. Trials would normally be required at the start of each pavement layer and if change of method or equipment deems it necessary as directed by the Engineer. The time for completion of the Contract shall not be extended because of the time needed to construct trial sections and evaluate the test on them.

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

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

131 Signboards

Add the following to this clause:

At the commencement of works, the Contractor shall provide and erect signboards; two on each end of the proposed Project Roads and enroute at least two as instructed by the Engineer. The signboards shall comply with the requirements and detail shown in the Book of Drawings. Any amendments to the details in the Book of Drawings, prior to the signboards being erected, shall be with the approval of the Engineer.

132 Engineer's accommodation, Office, Equipment & Furniture

The Contractor shall provide, erect and maintain for the duration of the Contract, the Engineer's housing and offices. A description of the accommodation and offices is given below.

In all cases the Contractor shall furnish, equip and maintain the buildings until the expiry of the Defects Liability Period.

At the end of the Contract, all Engineer's offices and houses shall revert to the Contractor. The office furniture/equipment and laboratory furniture/equipment shall revert to the employer.

132.1 Housing accommodation for the Engineer and his staff

Housing accommodation shall consist of one or more combinations of the five types of houses shown on the drawings. The houses shall be of semi-permanent construction. All materials shall be new, strong, durable and weather/termite proof with walls, ceilings, windows, doors and floors outside with two coats of paints approved by the Engineer. Each house shall be provided with a portable water supply and water borne sewerage system and shall be furnished and equipped in accordance with details in Table below.

The houses shall be wired for mains electricity and connected to a main power supply. In addition the Contractor shall provide a standby generator of approved type to serve Type 1, II and III housing and it shall be located to the satisfaction of the Engineer. The contractor shall be responsible for rubbish disposal by providing outside bins and a daily collection service to an approved central disposal area.

The houses and furniture shall revert to the Contractor at the end of the Contract.

Alternatively, the Contractor shall explore the possibility of providing the Engineer's staff houses accommodation on a rental basis but of similar type specified and shown in the Bill of Quantities. The accommodation shall be to the approval of the Engineer prior to negotiation and finalisation of the rental process.

The accommodation shall be available for the full duration of the project, upon commencement of the project.

Furniture requirements for the Engineer's houses are as shown in the schedule below.

Furniture Requirements for Engineers' Houses

Description	№ for each house unit			
	House Type I & II	House Type III	House Type IV	House Type V
Double bed with mattress	1	1	NIL	NIL
Single bed with mattress	2	2	2	2
Dining table 0.90 m by 1.5m	1	1	2	2
Carver chairs	2	2	NIL	NIL
Settee	1	1	NIL	NIL
Dining chairs	6	4	8	4
Bedroom chairs	4	2	NIL	NIL
Arm chairs with cushions	4	NIL	NIL	NIL
Dressing table with mirror and stool	1	1	NIL	NIL
Bathroom stool	1	1	NIL	NIL
Cupboard (hanging and shelved)	2	1	NIL	NIL
Desk (8 drawers)	1	1	NIL	NIL
Coffee table	2	1	NIL	NIL
Occasional table	2	1	NIL	NIL
Book case	2	1	NIL	NIL
Kitchen table	1	1	2	2
Side board	1	1	NIL	NIL
Kitchen chairs	2	1	NIL	NIL
Chest of drawers	2	1	NIL	NIL
Table lamp	1	1	NIL	NIL
Set of sheets for double bed	4	1	NIL	NIL
Set of sheets for single bed	4	2	NIL	NIL
Dinner service (set)	1	1	NIL	NIL
Set of cutlery	4	1	NIL	NIL
Set of pots and pans	1	1	NIL	NIL
Set of kitchen utensils	1	1	NIL	NIL
Table cloth	2	1	NIL	NIL

Description	№ for each house unit			
	House Type I & II	House Type III	House Type IV	House Type V
Set of house cleaning utensils	1	1	NIL	NIL
Electric or gas cooker with 4 plates and oven	1	1	NIL	NIL
Waste paper basket	4	2	2	2
Dustbin	1	1	2	2
Refrigerator with freezer capacity 180 litres	1	1	NIL	NIL
Gas or Electric hot water for kitchen & bathroom	1	1	NIL	NIL
2 Kw Air conditioners	3	2	NIL	NIL
Washing machine	1	1	NIL	NIL
Table fans	4	2	NIL	NIL
Carpet, 2.0m x 1.0m	3	NIL	NIL	NIL
Carpet, 3.0m x 4.0m	1	NIL	NIL	NIL
Curtains to all windows	YES	YES	YES	NO

132.2 Engineer's Senior Staff Housing –House Types I, II and III

The Contractor will be instructed by the Engineer as to the Number and type of new houses to be provided. Items are included in the Bill of Quantities for this purpose. The houses shall be 2, 3 or 4 bed-roomed as shown on the drawings.

Each house shall be erected on a separate adequately drained plot of at least 1,000 m². A chain-link dog proof fence with lockable gate shall be provided round each house plot.

The main access road to the Campsite shall be at least 5 m wide, adequately drained and surfaced with a minimum of 150 mm thick compacted gravel

The house shall be provided with a cold water storage tank, kitchen sink, wash hand basins, baths with shower attachments and showers. The plumbing shall be arranged such that hot and cold water supply is available at the kitchen sink, wash hands basins, bath showers. Standpipes with lockable taps shall be provided outside every house.

The Engineer's House Type 1 shall be provided with a direct line telephone.

The number of houses to be provided shall be as follows:

- Type I ~ 1 №
- Type II ~ 3 №
- Type III ~ 3 №
- Type IV ~ 3 №
- Type V ~ 8 №

Each type I and II house shall be provided with day and night watchmen and security lights, the cost of which shall be deemed to have been included in the rates for these houses.

The houses with the furniture shall revert to the Contractor at the end of the Contract.

132.3 Engineer's Junior Staff Housing-Housing Types IV and V

Items are included in the Bill of Quantities for construction of type IV houses. The houses shall also be of semi-permanent construction with concrete floor constructed or rented. The layout requirement is shown on the Drawings. The number of Type IV and V houses to be provided shall be 3 № and 8 № respectively.

The housing accommodation for junior staff may be adjacent to, but detached from the housing accommodation provided by the Contractor for his own employees.

132.4 Engineer's office

The Contractor shall provide, erect and maintain for the duration of the Contract, an office for the Engineer of weather proof construction, with windows, and doors suitably insulated against heat and cold, all to the satisfaction of the Engineer in respect of the condition, design and siting. The office shall be partitioned as shown on the drawings or as directed by the Engineer, with a clear inside height of 2.7 m. The floor shall be of steel floated concrete adequately damp and anti-proofed. The walls shall be plastered and, if necessary, painted with two coats of emulsion paint. The ceiling shall be soft board with 2 coats of paint. The layout requirement is shown on the drawings.

The office of the Engineer shall be completely separate from that of the Contractor. The Plot shall be not less than 2,500 m² in area and shall be fenced with a 2 m high barbed wire fence and gate with padlock and chain.

Two telephones shall be provided for the sole use of the Engineer and the offices shall be provided with Electric lighting and wall sockets all to the satisfaction of the Engineer.

A portable water supply shall be provided and all latrines shall have water borne sewage disposal system. A standby pipe with a lockable tap shall be provided outside the latrine.

The offices shall be wired for main electricity and connected to a main supply. In addition, a stand by generator of approved type shall be provided, located to the satisfaction of the Engineer.

Furniture and equipment for the Engineers Office shall be as listed in the Bill of Quantities and special specifications.

The Engineer's office and Laboratory furniture and equipment shall revert to the Employer at the end of the contract.

The Contractor, when instructed, shall provide and install at the Engineer's office the Equipment specified below with a dealer's certificate and warranty:

a). Engineer's office

KITCHEN UTENSILS				
Sno	Name	Quantity	Unit Cost Kshs	Total
1	saucers	10		
2	Cups	20		
3	Flasks (2.0L capacity)	4		
4	Drinking Water Glasses 2 SETS	2		
5	Water Jugs (1.0L Capacity)	3		
6	Executive Trays	4		
7	Trays	3		
8	Utensils Rack	1		
9	Tea Spoons	10		
10	Knives	4		
11	Forks	10		
12	Coaster	10		
13	Spoons	10		
14	Hand Towels	6		
15	Sugar Dishes	3		
16	Sufuria- set of 4 small, medium, large	1		
17	Basins	2		
18	white Board	2		
19	Cold hot water Dispenser	2		
20	External Hard Disk 500GB	4		
21	Mouse pads	3		
22	Flask Disk Transcend 8GB	6		

23	Extension cables 5 ways	6		
24	Cash Box	1		
STATIONERIES				
No.	Item	Quantity	Unit Cost Kshs	Total
1	Box Files each	10		
2	Pen Holders executive each	4		
3	Pen Holders each	3		
4	Embossed 2 Realms A4 Size	2		
5	Acetate 2 Reams A4 Size	2		
6	Acetate 1 Realm A3 Size	1		
7	Embossed 1 Realm A3 Size	1		
8	Pencils 2 packets	2		
9	Pens executive each	3		
10	pens 3boxes (black, blue, red)	5		
11	Acetate 1 Reams A3 Size	1		
12	A4 Coloured Printing Papers 5 Realms 5	1		
13	Envelopes A3 Package of 50	2		
14	Envelopes A4 Package of 50	4		
15	Envelopes B5 Package of 25	1		
16	Envelopes B6 Package of 25	1		
17	Staple removers(each)	6		
18	Glue Stick 40gm(each)	12		
19	Sticky Notes (each)	24		
20	Paper Clips in packets	4		
21	Note Books A5 SIZE (each)	24		
22	Duster(each)	2		
23	White Out(each)	12		
24	Rulers Packet	1		
25	Sharpeners in packet of 12	2		
26	Eraser in Packet of 12	2		
27	Highlighters (each)	12		
28	Folders 24 pieces	12		
29	Hardcovers A4 Size Notebooks	12		
30	Note Books A5 (spiral)	12		
31	Clip Boards(each)	12		
32	Pair of Scissors	2		
33	Delivery Note Book	4		
34	Cell tapes(each)	3		

35	White board markers(each)	6		
36	Hisense Screen	1		
37	Assorted Connectivity	1		

b). Photocopying Machine **1No.**

ITEM	MINIMUM SPECIFICATIONS
Print Method	Laser
Copy Speed	>= 43 pages per minute
Monthly print volume	Up to 20,000 pages
Paper Tray Capacity	2 x 500 sheets 100 sheets by pass tray
Media Sizes	A3, A4, A5, B4
Print Resolution	600 x 600 dpi
Duplex Printing	Automatic
Copier resize	25 – 400%
Salient features	Sleep mode (Power saver) Help function Journal report
Warranty	1 year

c). Personal Computer (PC) **6No.**

Processor	Intel i7 Processor Speed: 3.0GHz
System Memory	8GB, DDR3 SDRAM expandable to 16GB.
Primary Storage	1TB (7200rpm) SATA II Hard drive
CD/DVD Drive	16x DVD+/- RW Drive2 Drive with double layer write capability

Display	17" TFT Monitor with SXGA 1400x1280 pixels resolution display
Navigation	2 Button USB scroll mouse with mouse pad. Enhanced Quiet-key USB Space-saver
Audio	A525 Speakers for multimedia output
Communication Interface	Gigabit (UTP) network card with RJ45 port. The card must have the wake-on LAN feature enabled. Internal 11a/b/g WI-FI wireless card for wireless support.
I/O Interface	6 USB 2.0 (2 front and 4 Rear) 1 parallel port 1 VGA out Speakers line-out and headphone (front) 3 PCI expansion slots.
Operating System	Latest Windows with license
Pre-loaded Software	Latest Ms Office (Professional) installed with license
Anti-virus	Antivirus software with license
Warranty	3years
Preferred Brand	Dell
UPS	Make: APC Power Rating: 650VA Input Voltage: 220-270V MUST BE SUPPLIED WITH STANDARD POWER PLUG AND BACK TO BACK CABLES FOR CONNECTION TO CPU & MONITOR

d). Laptop **3No.**

ITEM	MINIMUM SPECIFICATIONS
Processor	Intel i7 3 GHz
System Memory	8GB DDR2 SDRAM 667MHz
Primary Storage	1 TB
Optical Drives	DVD+/-RW

Display	15" screen 1024x800 resolution
AC adapter	Compliant 100-240V / 50-60Hz
Wireless LAN	Internal Wi-Fi Card & Bluetooth
Navigation	Keyboard with touchpad dual pointing device & external USB optical mouse
Audio	Std stereo speakers, built-in microphone & headphone jacks
Modem	In-built with SIM slot
LAN Network Interfaces	100 Kbps Ethernet port RJ45
Operating System	Latest Genuine Windows Professional with license
Pre-loaded Applications	Latest MS Office Pro with license, Kaspersky Antivirus with license
Carry Case	One
PC Card slots	Card reader
Battery type & life	6 cell Li-Ion battery up to 5 hrs
Salient features	1.3 Mega pixel Webcam 4 x 2.0 USB slots Security cable lock slot
Warranty	3years
Preferred Brand	HP

e). Laser jet Printer specifications**1No.**

ITEM	MINIMUM SPECIFICATIONS
Print Speed	21ppm colour , 24ppm Black

Print Technology	Laser
Print quality, black	Up to 1200 X 1200 dpi
Memory	96MB
Processor speed	256MHz
Paper trays std	2
Paper Handling	150 sheet input tray, 250 sheet second paper tray
Duplex Printing (Printing on both sides)	Automatic
Paper sizes	Letter,A1, A3, A4, Legal, Executive, Index Cards, Envelops
Compatible Operating Systems	Windows, Linux, Macintosh
Connection interfaces	Hi-speed USB 2.0 Fast Ethernet 10/100/1000
Preferred brands	HP
Accessories supplied with printer	Connecting cables (Network + USB), Tonner, CD (Includes Software and user guides), Power cord
Warranty	1 year

f). UPS specifications

- | | |
|---------------------|--|
| 1. Rating | 650 VAC (minimum) |
| 2. Input Voltage | 220-240V (minimum) |
| 3. Output | 220-240V (minimum) |
| 4. Output frequency | 50-60HZ |
| 5. Battery module | minimum 25 minutes backup time on 50% rated |
| | a. Sealed Lead-acid |
| | b. Short recharge time (max. 5 hours for 100%) |

6. Protection

Output overload

Input output short-circuit

Software

1. XP Office Professional with licence
2. Antivirus Kaspersky (latest version)

<i>g). Camera Specifications</i>	<i>1 No.</i>
ITEM	MINIMUM SPECIFICATIONS
Pixels	20 mega pixel
Optical zoom	20x
Compatible recording media	Memory stick duo / Memory stick PRO duo / SD Memory Card
LCD	>= 3.0" (230K Pixels)
Stamina (Battery Life)	>= 110 minutes
Battery system	Lithium ION Battery
USB	2.0 High Speed
Still image record mode	JPEG
Supplied Accessories	Battery – Lithium ION Battery Battery Charger Multi cable Power Cord Application Software
Salient features	Battery remaining indicator Recording media remaining
indicator	Wrist strap Carry case

The contractor shall be paid for these under appropriate bill items in the BoQ.

132.5 Engineer's Main Laboratory

The contractor may be instructed by the Engineer under the said Clause to make payments of receipted accounts for such items such as laboratory equipment and

reagents or the Engineer may direct the Contractor to purchase the above. The Contractor will, on provision of receipts, be paid under the item heading in the Bills of Quantities.

The laboratory equipment would include:

DESCRIPTION	UNIT	QUANTITY
A. Furniture and Equipment for the Engineer's Laboratory		
Provide and maintain one (1) approved branded desktop computer with the following: Intel Core i7 processor, 20" TFT screen display, 750 GB SATA HDD storage, 8 GB DDR RAM, DVD $\pm$ RW multi-layer drive, NIC card, 540M graphics card complete with all accessories and pre-loaded with licensed Windows 7 Ultimate 64-bit OS, latest MS Office and MS Project. The PC should have full multimedia capabilities.	N _o	1
Provide and maintain Konica Minolta pagepro 1490 MF or similar approved desktop laser printer	N _o	1
UPS 600VA	N _o	1
Electronic Scientific Calculator 12 figures (Casio fx-995)	N _o	4
Reams of A4 photocopying paper	N _o	50
Stapling machine Ofrex size 66 or similar with 5000 staples	N _o	1
Stapling machine Ofrex size 50 or similar with 5000 staples	N _o	4
Pencil sharpener (desk mounted type)	N _o	2
Heavy duty paper punch	N _o	1
Ordinary paper punch	N _o	4
Filling tray	N _o	10
Refrigerator, 75 litre capacity	N _o	1
Vacuum cleaner of approved make, minimum 1000W power	N _o	1
900 watt 25 litre microwave oven with grill	N _o	1
Air conditioner unit, medium size	N _o	2
Writing desk, 2.2 m x 0.9 m with lockable drawers	N _o	1
Swivel chair, adjustable height, with arms	N _o	1
4-drawer lockable steel filing cabinets	N _o	2

3 m ² wooden book shelves	N _o	2
Drawing tables. 1.8 m x 0.9 m with drawer	N _o	2
Chairs for drawing tables	N _o	2
Typist table complete with a chair	N _o	1
Lockable cupboards	N _o	2
Soft board for wall notices, 2.0 m x 1.0 m	N _o	2
Bench for people waiting	N _o	1
Waste paper basket	N _o	6
Fire extinguishers, CO ₂ type 5 litre capacity	N _o	3
First aid kit for general purposes	N _o	2
First aid kit for snake bites	N _o	1
Set of laboratory cleaning and washing up equipment	N _o	1
Set of curtains for all windows	N _o	4
B. LABORATORY EQUIPMENT		
1.0 Compaction Test (AASHTO T99 & T180)		
Compaction moulds complete with base plate and extension collar 101.1.6 internal diameter x 116.43mm high	N _o	10
2.49kg compaction hammer, drop regulated to 304.8mm	N _o	2
4.536kg compaction hammer, drop regulated to 457.2mm	N _o	2
Electric vibrating Kango hammer fitted with steel tamper (BS1377) with support frame	N _o	1
Straight edge 300mm long with handles	N _o	4
Steel tamping rod (BS1377)	N _o	4
Compaction mould 152.4mm dia x 116.43 high complete with base plate and extension collar	N _o	2
Galvanized metal tray 1m x 0.5m x 75mm deep	N _o	4
75mm brush	N _o	2
Semi-automatic balance. 25kg capacity accurate to 10g, including weights	N _o	4
20mm BS Sieve, 300mm diameter	N _o	1

Stop clock	N _o	4
Electric oven, thermostatically controlled between 10 and 150 deg. Celsius, 0.2225 m ³ min. capacity	N _o	2
As item 106/30 but gas	N _o	1
Moisture content tins, 75mm dia calcium or aluminium plated	N _o	2
Cone penetrometer with gauge and automatically controlled test cup	N _o	2
2.0 Density (Sand Replacement Method BS 1377)		
Metal containers (450mm diameter)	N _o	2
Stainless steel tray 305mm diameter	N _o	2
Metal tray 300 x 300mm square, 40mm deep with 150mm diameter hole in the centre	N _o	2
Metal tray 500 x 500mm square, 50 mm deep, with 200mm diameter hole in the centre	N _o	2
Steel pegs for fixing tray in position	N _o	50
Sand pouring cylinder, 150mm diameter	N _o	3
Sand pouring cylinder, 200 mm diameter	N _o	3
Cold steel chisel 20mm x 300mm long	N _o	3
Cold steel chisel 10mm x 250mm long	N _o	3
1.5kg, 3.5kg hammers and 1 kg rubber mallet	Set	1
Scoop for removing excavated material from hole, 250mm long handle	N _o	4
100mm brush, soft	N _o	6
50mm brush, soft	N _o	10
Primus gas stove	N _o	1
Calibrating can 150mm diameter x 150mm deep	N _o	4
As item 106/62 but 200 mm diameter x 250mm deep	N _o	2
3.0 Density (Nuclear Method AASHTO T238)		
Nuclear densometer (Troxler 3411B or similar approved) complete with hole forming device and guide)	N _o	1

4.0 CBR (AASHTO T193)		
CBR mould, 152.4 dia x 178mm high, complete with perforated base plate and extension collar 50.8mm high that can be fitted to either end of the mould	Nº	25
Perforated swell plate 150mm diameter with an adjustable center post of rustproof metal provided with a lock-nut	Nº	25
2.25kg split surcharge weight	Nº	25
Set of annular surcharge weights	Nº	25
Solid base plate for CBR mould	Nº	25
Static Compaction displacer discs 1 Nº 61.4mm, 1 Nº 50.8mm and 2 Nº 38.8 thick	Nº	4
Disk lifting handle	Nº	6
Linear shrinkage mould	Nº	5
Static Compaction press, 50 tonnes capacity with an adjustable distance between platens of 530 to 250mm (hydraulic or mechanical operation and hand operated)	Nº	1
Set of guards for above press	Set	1
CBR load frame (electric and hand operated) including proving rings for 10 kN, 28 kN and 50 kN, stabilizing bar, piston and bracket.	Nº	1
Penetration gauge range 0-25mm	Nº	4
Swell measurement tripod complete with gauge calibrated in 0.01 divisions	Nº	4
Soaking tank for CBR moulds sufficient for at least 50 moulds.	Nº	1
5.0 Relative Density of Aggregates (BS 812)		
Wire mesh basket with apertures not greater than 6.5mm large enough to contain 2.5kg of aggregate	Set	2
A stout watertight container in which the basket can be freely suspended	Nº	2
Soft absorbent cloth (tea towel)	Nº	10

Shallow tray of area not less than 0.065m ²	N _o	2
An air tight container of similar capacity to the basket	N _o	2
Pycnometer of 1 litre capacity	N _o	4
Semi-automatic 5kg balance accurate to 0.1g to be of size and type to permit the basket containing the sample to be suspended in water (to be supplied with weights)	N _o	1
Hot air drier (electric)	N _o	1
6.0 Flakiness (BS 812)		
Flakiness gauge	N _o	1
ACV apparatus of 150mm internal diameter with plunger and base plate	N _o	1
Metal tamping rod 16mm diameter and 450mm to 600mm length with one end round	Set	2
Cylindrical measure to BS 812	N _o	2
7.0 LAA Test		
LAA Machine as el_42-530/01 or similar	N _o	1
Spare set of abrasive charges	N _o	2
8.0 Concrete: Cube and Compression Testing		
Concrete compression machine, to BS 1610 grade A with 300mm gauge, rectangular platens, capacity 1560kN. complete with safety guard 50, 70, 100mm distance pieces and electro-mechanical load pacer	N _o	1
9.0 Concrete: Slump and Cube Manufacture (BS 1881)		
Slump cone, tamping rod and base	N _o	2
Concrete cube mould (150 mm cube)	N _o	20
Curing tank for cubes (Capacity 50 N _o)	N _o	1
Cube Tamping rods	N _o	8
10.0 Aggregates and Chippings		

Metal tamping rod 16mm diameter and 450mm to 600mm length with one end round	Set	1
Beaker 250ml	No	2
Thermometer 0° C to +50° C	No	2
Thermometer 0° C to +250° C	No	2
Reagent grade silica gel, 500g container	No	20
11.0 Bitumen Spray Test (BS 1707)		
Steel tray 20 mm deep x 0.1 m ² (for measuring bitumen spray quantity) including purpose made detachable handle 1.5 m long to enable trays to be picked up.	No	6
12.0 Consumables and Sundries		
Paraffin wax	kg	50
Gas	kg	600
Gunny sack	No	500
Plastic bag 900 x 450mm x 1000 gauge	No	500
Plastic bag 900 x 450mm x 500 gauge	No	500
Plastic bag 450 x 300mm x 1000 gauge	No	250
Plastic bag 450 x 300mm x 500 gauge	No	600
Filter paper 150 mm diameter Watman No 5 (Boxes of 100)	No	25
Filter paper 450 mm diameter Watman No 5 (Boxes of 100)	No	25
Filter paper 100 mm diameter Watman No 5 (Boxes of 100)	No	25
Trichloroethylene 205 little drum	No	2
Cotton waste (or drying cloths)	kg	25
Filter paper 270 mm diameter 33 mm with diameter Hole in centre, Watman No 5 (Box of 100)	No	20
Filter paper 400 mm diameter Watman No 54 (box of 100)	No	25
Gas cylinder compatible with stove supplied under Item 106/61	No	6

13.0 Marshall Test ASTM D1559		
Specimen mould assembly	N _o	3
Specimen extractor	N _o	1
Marshall Compactor, complete	N _o	1
Marshall testing machine complete inducting flow meter	N _o	1
Electric mixer with isomantle	N _o	1
Water bath	N _o	1
200mm x 200mm x 50mm deep steel baking trays	N _o	6
Pots suitable for heating bitumen	N _o	6
Spatulas	N _o	3
Dial thermometers 10° C to 210° C	N _o	3
Pairs of gloves for handling hot material	N _o	10
Pairs of rubber gloves to remove specimens from water bath	N _o	4
Flat bottomed scoop	N _o	2
Ladle for placing mixture in moulds	N _o	2
Gyratory compactor (laboratory mix design) ELE SERVO PAC or equivalent with 100mm and 150mm diameter moulds	N _o	1
Vibratory hammer complete with shanks, tampers, 6 moulds and 7 base plates	N _o	1
14.0 Maximum S. G. of Bituminous Paving Mixtures (ASTM D2041)		
Balance of sufficient capacity and sensitivity to enable maximum specific gravity of samples of uncompacted paving mixtures to be calculated to at least four significant figures, it shall be equipped with a suitable suspension apparatus to permit weighing of the samples while suspended centre of the pan	N _o	1
Vacuum pump	N _o	1

Glass or metal container of at least 1,000ml capacity it shall be sufficiently strong to withstand a partial vacuum, it shall have a cover fitted with a rubber gasket and a hose connection. Fine wire mesh shall cover the hose opening to prevent loss of fines. The top surface of the container shall be smooth and substantially plane.	Nº	1
15.0 Quantitative Extraction of Bitumen from Bituminous Mixtures ASTM D2172 AND ASTM D95		
Water bath for use with bowl suitable for immersing the bowl and apparatus for suspending the bowl from the centre of the scale pan	Nº	1
Oven capable of maintaining temperature at 100° C to 104° C	Nº	1
Flat pan 300mm x 200mm x 25mm deep	Nº	1
Balance capacity 5000g accurate to 0.2g	Nº	1
Balance capacity 15000g accurate to 1.0g	Nº	1
Small mouth graduate 1000ml capacity	Nº	4
Ignition dish 125mm capacity	Nº	4
Dessicator	Nº	1
Analytical balance	Nº	1
Centrifuge to ASTM E2172	Nº	1
Filter rings for centrifuge		150
Reflux condenser to ASTM E95	Nº	4
Petroleum naphthalene	Litre	150
Trichoethylene reagent grade	Litre	5
Extractor fan	Nº	1
16.0 Recovery of Bitumen from solution		
Centrifuge to AASHTO T170	Nº	1
Centrifuge tubes	Nº	10
Distillation assembly to AASHTO T170	Nº	1

Water jacketed condenser	Nº	1
ASTM low distillation thermometer with range 2° C to 300°C	Nº	2
Gas flow meter	Nº	1
Corks drilled as AASHTO T170	Nº	10
Separator funnel 125ml capacity	Nº	1
Supply of carbon dioxide	kg	30
Flexing tubing	m	20
Sodium Hexamataphosphate	kg	5
17.0 Other Consumables		
Sand for density test	kg	500
Calcium carbide	kg	5
Sodium sulphate (anhydrous salt)	kg	5
Sodium hydroxide (reagent grade)	kg	1
Potassium dichromate (reagent grade)	kg	1
Sulphuric acid (concentrated)	Litre	1
18.0 Sieve Analysis		
BS Sieve 300 mm diameter in sizes 75, 63, 50, 37.5, 28, 20, 14, 10, 6.3, 5 and 4mm, plus lid and receiver	set	1
BS Steve 200 mm diameter in sizes 2, 1, 0.6, 0.5, 0.425, 0.30, 0.15 and 0.075 plus lid and receiver	Set	1
Electric sieve shaker	Nº	1
BS Sieve 200 mm diameter 0.425 and 0.075mm	Set	2
1m x 1m x 75mm deep galvanized metal tray	Nº	5
Riffle box with 50mm slots (BS 1377)	Set	2
19.0 Miscellaneous Equipment		
Wheel barrow	Nº	4

Dustpan brush	N _o	4
Shovel	N _o	4
Pick axe with handle	N _o	4
Metal scoop, large (150m wide)	N _o	4
Metal scoop, medium (100m wide)	N _o	2
Garden trowel	N _o	4
Steel tray 0.3 x 0.3 x 0.01 deep	Set	8
Palette knife 200mm long blade	N _o	4
Palette knife 100mm long blade	Set	4
BS Sieve 450 diameter 37.5 mm	N _o	1
BS Sieve 450 diameter 20 mm	N _o	2
BS Sieve 450 diameter 5 mm	N _o	2
BS Sieve 450 diameter 0.6mm	N _o	4
BS Sieve 450 diameter 0.425 mm	N _o	10
BS Sieve 450 diameter 0.3 mm	N _o	4
BS Sieve 450 diameter 0.075mm	N _o	4
Lid and receiver for Item 165 to item 175	Set	1
BS sieve brush	N _o	4
Measuring cylinder set 25ml, 100ml, 500ml, 1000ml, 200ml	N _o	4
Glass jar capacity 5 litres	N _o	2
200mm x 200mm x 20mm cadmium plated or aluminium tin	N _o	2
Electronic balance capacity 1000g accurate to 0.01gm	N _o	2
Balance 2000g capacity accurate to 0.1g (manual) including weights	N _o	2
Balance 50kg capacity accurate to 10g including weights	N _o	1
Still for producing distilled water	N _o	1
Polythene or glass 20 litres storage vessels with tap at bottom	N _o	2

Stiff broom	No	4
Vernier calipers, 150mm	No	2
Vernier calipers, 250mm	No	2
Pestle and mortar	No	2
Linear shrinkage mould (BS 1377)	No	2
Average least dimension gauge	No	2
Plastic or metal bucket including lid, 10 litres capacity	No	2
Polythene wash bottle (500ml)	No	20
A4 size clipboard	No	6
Thermometer range 50°C to 150°C, glass (BS 593)	No	2
Laboratory thermometer, range 0°C to 250°C (BS 593)	No	2
Lockable tool box containing 1 pr "mole grips" 2*150mm screw driver, 2*300mm screw driver (1 standard and 1 Phillips head of each) adjustable spanners 200mm and 300mm 1 general purpose pliers, 1 plastic faced mallet (kg), 1 set imperial spanners 14: to 15/16" 1 set metric spanners 8mm to 20mm 2 tyre pressure gauge range 0-100 p.s.i	No	1
Maximum and Minimum Thermometer (BS 692)	No	2
Rain Gauge	No	1
Pocket dial thermometer +50°C to 250°C accurate to +3% with 0.75m long	No	4
5 litre capacity steel storage containers with leak and dustproof lids for storage of bitumen samples	No	6
Hotplate 200mm diameter with thermostat heat control unit	No	2
450mm diameter x 150mm deep basins	No	5
20.0 Standard Specifications		

Copies of each of the following standard specifications (Latest edition). The Contractor shall supply the other standards quoted in the Contract but the cost of these shall be deemed to have been included in other rates elsewhere.		
BS 812	No	1
BS 882	No	1
BS 1377	No	1
BS 1881	No	1
BS 1924	No	1
ASTM 04.03	No	1
AASHTO - GDPS - 3 V3	No	1
AASHTO HM - 25 (PART I & PART II)	Set	1

The survey equipment and design software to be provided would include:

Description	No
Engineer's automatic level Wild NAK - 1 or similar including tripod	1
Set of tripods (wild or similar)	1
Survey umbrella 1	1
2.5m ranging rod (metallic)	2
Levelling staff 5m with levelling bubble (wild iNLE 3 or similar)	2
1m stainless steel straight edge	1
3m aluminium straight edge	2
30m steel white face tape	2
100m steel band tape	2
3m tape measure	2
Steel tape repair outfit	1
2kg hammer	2
Pangas 16" straight	5

Roll of tracing paper 750 mm x 20 m	5
Drawing office stools	2
Latest Highway program for geometric design, drawing of cross sections and quantity calculation	1
Provide licensed AutoCAD 2015 software or Latest	1

Geodetic GNSS Receivers with downloading software

Specification	Minimum Requirements	Detailed Requirements
GNSS Performance	GNSS technology	Smart Track technology: • Advanced measurement engine • Jamming resistant measurements • High precision pulse aperture multipath correlator for pseudorange measurements • Excellent low elevation tracking • Very low noise GNSS carrier phase measurements with <0.5 mm precision • Minimum acquisition time
	Smart Track technology:	Smart Track technology:
	Max. simultaneous tracked satellites	Up to 60 Satellites simultaneously on two frequencies
	Satellite signals tracking	• GPS: L1, L2, L2C • GLONASS: L1, L2 • Galileo, QZSS2 • BeiDou B1, B2 • SBAS: WAAS, EGNOS, GAGAN, MSAS
	Reacquisition time	< 1.2 sec
	Position latency	< 20m/ sec
Measurement Performance & Accuracy	DGPS / RTCM	Typically 25 cm
	Single Baseline (<30 km)	Horizontal: 8 mm + 1 ppm Vertical: 15 mm + 1 ppm
	Network RTK	Horizontal: 8 mm + 0.5 ppm Vertical: 15 mm + 0.5 ppm
	RTK technology	Smart Check technology
	Reliability	Better than 99.99%3
	Time for initialization	< 45 sec
	OTF range	Up to 70 km2

	Supported RTK network solutions	VRS, FKP, iMAX
	Supported RTK network standards	MAC (Master Auxiliary Concept) approved by RTCM SC 104
Hardware	Weight	1.4 kg
	Weight	2.90 kg standard RTK rover including controller, batteries, pole and bracket
	Dimension (diameter x height)	198.5 mm x 197.5 mm x H 99 mm
	Supply voltage	Nominal 12 V DC Range 10.5 – 28 V DC
	Power consumption	Internal power supply Recharge & removable LI-Ion battery,
	Internal power supply, operation time	• 10.00 h static observations • 7.00 h receiving RTK data with internal UHF radio • 5.00 h transmitting RTK data with internal UHF radio • 6.00 h receiving / transmitting RTK data with internal modem
	External power supply	Rechargeable external NiMh battery 9 Ah / 12 V
Memory & Data Recording	Memory medium	Removable microSD Card: 1 GB
	Data capacity	1 GB
	Type of data	Onboard recording of: • GNSS raw data • RINEX data
	Recording rate	Up to 20 Hz
User Interface	Buttons	• ON / OFF button • Function button
	Button functionality	Function button: • Easy switch between Rover / Base mode • Easy “Here” positioning functionality
	Led status indicator	<i>Bluetooth®</i> , position, RTK Rover status, RTK Base status, data logging, internal power status, external power status

	Additional user interface	Additional web interface functionality provides full status indicator and configuration options
Communications	Communication ports	1 x USB / RS232 Lemo 1 x <i>Bluetooth®</i> port, <i>Bluetooth®</i> v2.00+ EDR, class 2
	Radio modem	- Fully integrated, fully sealed receive and transmit radios - SATEL, Pacific Crest and TrimTalk support 403 – 473 MHz bandwidth - Output power 1W max.
	UHF antenna options	• External UHF antenna connector (Type QN)
	GSM / UMTS phone modem	- Fully integrated, fully sealed 3.75G phone modem - Quad-Band GSM / GPRS: 850 / 900 / 1800 / 1900 MHz - Penta-Band UMTS: 800 / 850 / 900 / 1900 / 2100 MHz - DynDNS service support – Base station supports up to 10 rovers via TCP/IP
	GSM / UMTS antenna	• Integrated GSM / UMTS antenna
	Radio modems	Support of any suitable UHF / VHF radio
	Real-time data formats for data transmission and reception	CMR, CMR+
	Real-time data formats according RTCM standard for data transmission and reception	RTCM 2.2, RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2 MSM Full support of RTCM 3 Transformation Message

The complete list of all the equipment is as itemised and quantified in the bill of quantities.

The contractor may be directed to pay for stationery, equipment or reagents that are foresaid and also pay for servicing and repair of the laboratory equipment being used on the project.

The Contractor shall provide, install and maintain in a good state of repair, such laboratory, survey and other equipment as listed for the duration of the contract.

Such equipment shall be of approved manufacture, and shall be made available to the Engineer for the Engineer's exclusive use throughout the Contract, not later than three (3) weeks after the Engineer's order to supply. All equipment shall be ready to use and complete to perform the tests. The equipment shall revert to the Employer on completion of the Contract.

Any delays to the Contractor or the Contractor's activities caused by the Engineer being unable to perform survey work, field or laboratory tests due to the contractor's failure to supply an/or maintain the said equipment shall be deemed to have been caused entirely by the Contractors own actions, and any consequences of such delays shall be interpreted as such.

The payment to comply with this requirement is provided in the Bill of Quantities and ownership of all equipment shall revert to the Employer after the completion of the Works.

Failure by the Contractor to provide or maintain the equipment shall make him responsible to bear all costs that may be incurred as a result of the Engineer's staff using alternative means of communication, including delays in supervision and approval of Works by the Engineer.

132.7 Engineer's Office

Furniture and equipment for the Engineer's office shall be as listed in the Bill of Quantities. It shall also be the Contractor's responsibility to replenish consumables when instructed by the Engineer. The Engineer's office and furniture will revert to the Employer on completion of the contract.

132.8 Engineer's Survey Equipment

a) General

The Contractor shall provide, install and maintain in a good state of repair for the duration of the Contract, such survey and other equipment as listed in the Bill of Quantities. Such equipment shall be of approved manufacturer and shall be made available to the Engineer within the following time periods:

- Survey equipment, not more than 30 days after the Engineer's Order to Supply

Any delays to the Contractor or the Contractor's activities caused by the Engineer being unable to perform survey work due to the Contractor's failure to supply and/or maintain

the said equipment shall be deemed to have been caused by the Contractor's own actions and any consequences of such delays shall be interpreted as such.

The survey equipment shall revert to the Employer on completion of the Contract.

132.9 Wireless Communication for the Engineer**a) Mobile phones**

The Contractor shall, if so instructed by the Engineer, provide, connect and maintain mobile phones for the exclusive use by the Engineer and for the duration of the Contract. The Contractor shall provide airtime for these mobile phones as directed by the Engineer.

Details of the numbers of mobile phones to be provided are included in the Bill of Quantities. Payment for complying with these requirements is also included in the Bill of Quantities.

133 Time for Erection of the Engineer's Staff Houses, Offices

The time for completion of all housing for the Engineer's office, senior and junior staff shall be as specified in the Standard Specification.

During the duration from the commencement of period of performance until taking over of the Engineer's houses and office the Contractor shall provide suitable hotel or rented accommodation and appropriately located temporary office space all adequately furnished and equipped to the approval of the Engineer. The contractor shall be deemed to have allowed in his rates for the temporary accommodation of the Resident Engineer, Materials Engineer, Senior Surveyor and three support staff during this mobilization period and no separate payment will be made.

137 Attendance upon the Engineer and His staff

Further to the provisions of Clause 137 of the Standard Specification, the Engineer may instruct the Contractor to provide the staff for attendance to the Resident Engineer in accordance with the following Sub-Clauses:

137.1 Staff employed and paid by the Contractor for attendance upon the Engineer

The Engineer may instruct employment of staff listed below by the Contractor for attendance upon the Resident Engineer. The Contractor shall provide housing as described under Clause 132 of this Specification and pay the salaries, allowances and benefits as determined by the Engineer and claim reimbursement under the BOQ. These shall be subject to the statutory deductions, namely PAYE, NSSF and NHIF which the Contractor shall remit to the relevant authorities every month with copy of each remittance being submitted to the Engineer for his records.

- (a) 1 № Assistant Engineer
- (b) 3 № Inspector of Works

- (c) 2 № Laboratory technician
- (d) 3 № Assistant Laboratory technician
- (e) 1 № Draftsman
- (f) 1 No. General Clerk
- (g) 2 No. Survey assistant
- (h) 1 № Secretary
- (i) 1 № Office Assistant
- (j) 6 № Chainmen
- (k) 6 № General Attendants

The Engineer shall interview, select and recommend for employment all the positions listed above. Upon employment, the Contractor shall provide each with an Employment Contract in accordance with the Employment Act, 2007 or the latest amendment of the Act, stating therein the conditions of employment. At the end of the Contract Period or termination of services, whichever comes earlier, each employee shall be issued with a Certificate of Service as provided for in the foregoing Act. Use of documents drafted by the Engineer shall not relieve the Contractor of his duties and obligations under this Clause.

137.2 Staff and housing to be provided by the Contractor for attendance upon the Engineer

The Contractor shall provide housing for staff listed below for attendance upon the Resident Engineer and be responsible for paying the salaries, allowances and benefits at rates not lower than the current rates approved in the latest Collective Agreement for the Kenya Building Construction and Engineering and Allied Trade Workers Union issued by the Industrial Court of Kenya or any other court duly established under provisions of the Constitution of Kenya. In addition, the Contractor shall provide all housing or housing allowance and other amenities for these staff within close proximity to the Engineer's office and laboratory to the same standard as those provided under Clause 132.

- (a) 1 № Assistant Engineer
- (b) 3 № Inspector of Works
- (c) 2 № Laboratory technician
- (d) 3 № Assistant Laboratory technician
- (e) 1 № Draftsman
- (f) 1 No. General Clerk
- (g) 2 No. Survey assistant
- (h) 1 № Secretary
- (i) 1 № Office Assistant
- (j) 6 № Chainmen

(k) 6 № General Attendants

The remuneration shall be reviewed periodically as stipulated in the approved documents on which the package is based. No additional payment will be made for provision of the staff, including housing and remuneration as specified in this Sub-Clause, and the cost will be deemed to be included in the rates for other items.

138 Provision of vehicles

Replace the first and second paragraphs of this clause with the following

The Contractor shall supply new vehicles and maintain them for the exclusive use of the Engineer and his staff, for any purpose whatsoever authorised by the Engineer.

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

- (a) One (1) Type 2: Minimum 2.8-litre turbo charged diesel 4-wheel drive, or similar approved twin-cab pick-up fitted with 2-way radio call system.
- (b) Two (2) Type 3: Minimum 2.8 litre 4-wheel drive, single cabins or similar approved fitted with 2-way radio call system.

Ownership of the vehicles supplied to the Engineer shall revert to the Contractor upon completion of construction.

Two Type 1 and One Type 2 vehicles will be supplied and maintained throughout the 24 month Defects Liability Period. Payment will be made as for the vehicles to be supplied during the construction period. Ownership of these vehicles will revert to the Contractor at the end of the Defects Liability Period.

140 Payment of Overtime for Engineer's Junior Staff

The following shall also constitute part of the Engineer's junior staff:

- a) 1 № Assistant Engineer
- b) 3 № Inspector of Works
- c) 2 № Laboratory technician
- d) 3 № Assistant Laboratory technician

- e) 1 № Draftsman
- f) 1 No. General Clerk
- g) 2 No. Survey assistant
- h) 1 № Secretary
- i) 1 № Office Assistant
- j) 6 № Chainmen
- k) 6 № General Attendants

If the Contractor wishes to execute the works on regular basis outside the Engineer's normal working hours as given in Clause 108, over a prolonged period, the Engineer may if he deems it necessary, employ additional supervisory staff for which the required salaries shall be in full by the contractor through the Engineer's office. In addition, the Contractor shall provide the required accommodation for such staff at his own cost. The Contractor shall not be reimbursed any of this cost.

141 Measurement and Payment

Item: Mobile Telephones

The provision of mobile phones units for the Engineer shall be measured and paid for by the number. The rate entered in the Bill of Quantities shall include for the costs of providing the mobile units complete with charger unit, a "hands free" headset, connection to the network and all service charges applicable.

Add the Following clauses:

142 Protection of the Environment

Further to the requirements of Sub-clause 19.1 of the Conditions of Contract, the Contractor shall be responsible for the following measures to protect the environment.

- (a) Compliance with national and local statutes and regulations relating to protection of the environment. The Contractor will be responsible for familiarizing himself with all existing national and local legislation in this regard.
- (b) All construction activities shall be carried out using the best possible means to reduce environmental pollution such as noise, dust and smoke. All vehicles and plant shall be regularly serviced in accordance with the manufacturer's recommendations to ensure that they operate efficiently and without excessive noxious emissions. The Engineer will have the authority to instruct the Contractor to temporally cease operations and/or remove from the site vehicles or plant which do not comply with this requirements,

until such time that he is satisfied that the best practicable means to reduce environmental pollution to a minimum are being used.

- (c) The Contractor shall at all times maintain all sites under his control in a clean and tidy condition and shall provide appropriate and adequate facilities for the temporary storage of all waste prior to disposal.
- (d) The Contractor shall be responsible for the safe transportation and disposal of all waste generated as a result of his activities in such a manner as will not give rise to environmental pollution in any form or hazard to human or animal health. In the event of any third party being employed to dispose of waste, the Contractor shall be considered to have discharged his responsibilities under this Clause from the time at which waste leaves sites under his control, providing that he has satisfied himself that the proposed transportation and disposal arrangements are such as will not give rise to pollution or health hazard.
- (e) The Contractor shall be responsible for the provision of adequate sanitary facilities for his workforce, and that of his subcontractors at all construction and ancillary sites. The Contractor shall not allow the discharge of any untreated sanitary waste to ground water or any water of ground surface watercourse.
- (f) All concrete and asphalt plants shall be operated and maintained in accordance with the original manufacturers specifications and manuals, and in such a manner as to minimize emissions of hydro-carbons and particulate if in the opinion of the Engineer the operation of such plant is causing or is likely to cause nuisance or health problems to the site staff or the general public. The Contractor shall carry out such work as is necessary to reduce emissions to an acceptable level within a time-scale agreed with the Engineer.
- (g) The Contractor shall regularly spray with water all exposed dirt surfaces to reduce dust levels.
- (h) The Contractor shall take all responsible measures, at all sites under his control to prevent spillage and leakage of material likely to cause pollution of water resources. Such measures shall include but not be limited to the provisions of bunds around fuel, oil and bitumen storage facilities and provision of oil and grease traps for servicing and fuelling areas. Prior to construction of such facilities the Contractor shall submit details of pollution prevention measures to the Engineer for his approval.

- (i) The Contractor shall be responsible for ensuring that exposed surfaces are re-vegetated as construction progresses all to the satisfaction of the Engineer.
- (j) The removal of trees shall be kept to the minimum necessary to accommodate the permanent works. Prior to the removal of any trees the contractor shall inform the Engineer of the intended operation and obtain the permission of the Engineer for the removal of the trees. If any tree is removed without permission the Contractor shall replace it with an approved tree at no additional cost to the Employer.
- (k) The Contractor shall ensure that fires, except for controlled fires for burning rubbish, do not start within the Site or in the environs thereto as a result of the works or from the actions of his employees. The burning of waste, such as vehicle tyres causing noxious emissions is prohibited. The contractor shall have available at all times trained fire-fighting personnel provided with adequate fire-fighting equipment to deal with all fires. The contractor shall additionally at all times provide sufficient fire protection and fighting equipment locally to parts of the works which constitutes particular fire hazards.

No separate payment shall be made in respect of this Clause 142 and the Contractor shall be deemed to have allowed in his general rates and prices for the costs of complying with the requirements of this clause.

143 Off Road Environmental Measures

In addition to the provisions of Clause 142 above and all other requirements of the Conditions of Contract, Standard and Special Specifications, the Employer and the National Environmental Management Authority (NEMA) may order certain environmental measures to be carried out which are off the road and not specifically covered under these provisions. The Contractor shall carry out such works with equipment, labour and plant provided under the Contract or shall make such arrangements for specialized works to be carried out by a specialized subcontractor.

The Contractor shall be paid for all direct expenses under a provisional Sum in the Bill of Quantities and a percentage (%) for his handling costs and profits.

144 Staff Training

The Contractor shall allow for training of engineers, technicians and other support staff as may be instructed by the Engineer.

The payment of the allowances of such staff shall be made as instructed by the Engineer under the relevant item of the Bills of Quantities.

200 MATERIALS AND TESTING OF MATERIALS

205 Soils and Gravels

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

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

211 Bituminous Binders

(a) Requirements

(ii) Straight run bitumen

The ash content of penetration grade bitumen shall not exceed 0.5% by weight.

300 SETTING OUT AND TOLERANCES

301 Setting Out

(a) General

If traverse points to be used for setting out are close to the existing carriageway and interfere with the construction works, the Contractor shall relocate them to a location where they will not be disturbed. The coordinates and heights of all transverse points so relocated shall be listed and provided to the Engineer for checking and/or approval. The Contractor shall also reference with monuments the new road centrelines every 200 m long straight sections and at all salient points along curves, consisting of a pin in a concrete beacon, before commencement of any works.

The roads reserve boundary posts shall have 12 mm diameter steel pins, 200 mm long embedded in concrete with 25 mm exposed and sticking from the top surface. This pin shall be coordinated and heightened and details of the same shall be provided to the Engineer for approval.

(b) Detailed setting out

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

400 SITE CLEARANCE AND TOP SOIL STRIPPING**401 Site Clearance**

Add the following as the last paragraph of Sub-clause (a).

Site clearance⁷ is not required over the paved width of the existing road and shoulders. No measurements and payment for site clearance will be made for this width. The remaining area within the road reserve including the sides of the existing embankments and cutting should be cleared as instructed by the Engineer. This operation shall also include the removal of selected trees as directed by the Engineer. The Contractor shall provide paint and all the assistance the Engineer may require to mark the trees which should not be removed during site clearance.

The Contractor shall take care not to uproot or damage trees which are within the road reserve but outside the construction width. After the contractor has staked out the extent of the road, the Engineer with assistance of the Contractor shall mark out the trees to be removed. After removal the trunk and branches of these trees shall be cut into pieces not more than 2.0 m in length, transported and neatly stored at the nearest Ministry of Roads camp at a position to be indicated by the Engineer. Payment for this work shall be as detailed in the Bill of Quantities. The rate inserted by the Contractor for this work shall include the cost of complying with all the requirements of this clause.

500 EARTHWORKS**502 General**

Renumber the existing text as 502.1 and add the following Sub-clause 502.2 to this clause:

502.2 Definitions for Earthworks

Formation level is defined as the lower (bottom) level of sub-base. Sub-grade is the material within 300 mm or such other thickness as may be shown on the drawings, below the formation level. Earthworks are defined as the works below the sub-grade level.

504 Preparation Prior to Forming Embankments

Renumber the existing text as 504.1 and add Sub-clauses 504.2 and 504.3 as follows;

504.2 Benching

Where shown on the drawings or instructed by the Engineer, the Contractor shall, where fill is required, excavate benches where the ground to receive the fill has a slope greater than 1 (vertical): 5 (horizontal).

Where benching is required, the existing ground, after removal of top soil in accordance with the requirements of Section 4 of the Specification, shall be benched by cutting steps such that the horizontal width between the cut face of the bench and the instructed final embankment slope is not less than 1.5 m. Each slope shall be graded to a slope of 1 in 40 from the centreline of the road so as to avoid the pounding of water. The minimum width of 1.5 m shall generally be required for each bench and the Contractor shall allow working in narrow widths.

All earthworks in widening shall be compacted to 100% MDD (AASHTO T99).

The volume of material cut from benches and its re-utilization shall not be measured for payment but is deemed to be included in the Contractor's rates for earthworks.

504.3 Ground Compaction

After top soil stripping in accordance with Section 4 of the Specification and benching in accordance with Clause 504 of the Specification, the existing ground, including benches, under embankments shall be compacted to a dry density of at least 95% MDD (AASHTO T99) to a depth of 150 mm below ground level unless otherwise directed by the Engineer. Compaction of benches other than the first bench will not be separately measured and is deemed to be included in the Contractor's rates for earthworks.

505 Construction of Embankments

Only material approved by the Engineer shall be used in embankments. Material with high swelling characteristics or high organic matter content and other undesirable material shall not be used, unless specifically authorized by the Engineer. Unsuitable material shall include:

- Material containing more than 5% by weight of organic matter, such as topsoil , humus, material from swamps, mud ,log stumps and perishable material
- Material with a swell of more than 3%
- Clay with a liquid limit exceeding 50%
- Material having moisture content greater than 105% of optimum moisture content (standard compaction) in its naturally occurring state.

Material for sub-grade shall meet the following requirements:

- CBR of not less than 15% measured after 4 day soak on a laboratory mix compacted to a dry density of 100% MDD(T99)
- Swell less than 1% on the laboratory mix sample
- Maximum dry Density (MDD) not less than 1500 kg/m².

Add the following:

In case the Contractor has in his possession heavy compaction equipment, he may opt to construct the sub-grade in a single layer of 300 mm thickness, following compaction trials and upon the Engineer's approval.

Rename the existing text of the Standard Specification as 507.1 and add the following to this clause:

507.2 Rock fill in Embankment and Behind Structures**(a) Scope of Application**

With the approval of the Engineer, the rock fill Material can be used only in the following circumstances:

- (i) Where the height of embankment is more than 3 m, including formation level, the lowest 1.0 m thickness can be constructed using rockfill.

(ii) For all heights, the sloped portion beyond shoulder can be constructed using with provision that, under all circumstances, a minimum of 500 mm thick earthen cushion shall be available between formation level and top level of rockfill.

(iii) Behind the structures irrespective of the height of embankment up to the bottom of sub-grade.

(b) Material

The maximum size of stones shall not exceed 300 mm in any direction. The voids between rocks shall be filled by smaller rock fragments.

(c) Spreading and Compaction

The method of compaction as specified under Clause 507.1 of the Standard Specification and/or as directed by the Engineer, should ensure that no boulders are loosely packed and can move or rock after compaction. The top layer as well as the sides of the retaining normal earth fill on one side shall be fully blinded with filter media comprising crushed aggregate and sand. The grading and layering of filter media shall be such as to form effective filter layer through which particles of inner soil fill of embankment are not able to migrate into the rock fill layer in the process of settlement/consolidation or due to movement of water. The layer work shall combine with the layers of the adjacent rock fill so as to facilitate simultaneous compaction.

(d) Rates

The rates are applicable to completed construction as measured by taking levels before and after compaction up to the top of blinding/filter media 300 mm thick and are inclusive of all materials, void filling materials, blinding materials and filter media.

The preload material shall be removed from any stage of the construction when, in the opinion of the Engineer, based on settlement monitoring records, the required primary consolidation of the soft silts has been achieved.

Based on consolidation properties of soil, expected preload time shall be estimated for each stage. However, this time can be influenced, not only by settlement, but also by the rains. The Contractor will not be entitled to extra payment should these times be varied due to the site conditions or the rains.

(e) Settlement Monitoring

Continuous monitoring of settlement will be necessary to check the efficiency of the system. The instruments for monitoring settlement and stability shall include settlement platforms, Piezometers to determine if pore pressures are exceeding limits

that might endanger stability, and Inclinometers to determine if lateral movement occurs.

Settlement monitoring devices shall be installed at the Contractor's cost to monitor the settlement behaviour of ground under fill, to establish the effectiveness of the drainage system. The Contractor shall carry out the settlement monitoring works, including the installation of all the required equipment, in accordance with Standard Specification.

508 Compaction of Earthworks

Fill above ground level adjacent to pipe culverts shall be compacted in layers not exceeding 150 mm in thickness to a field density of 100% MDD (AASHTO T99) up to the level of the top of the pipes or top of surround. The compaction shall extend for a width equal to the internal diameter of the pipe on either side of the pipe (s) or surround (s).

Adjacent to the structures, all fill above ground level up to the underside of the sub-grade shall be compacted in layers not exceeding 150 mm in thickness to a field density of 100% MDD (AASHTO T99). In case of fill around box culverts, this shall be carried out for the full width of the fill and for a length bounded by the vertical plane passing through the ends of wing walls.

Where the formation in cut areas is formed of hard material, the Contractor shall remove the hard material to a depth of 200 mm or such other depth as may be directed by the Engineer. The void so formed shall be backfilled with sub-grade quality material and compacted to the same standard and tolerances as for sub-grade in fill.

Improved sub-grade, where required as part of the embankment construction shall be compacted and finished to the same standards and tolerances as those required for normal sub-grade.

509 Mass Haul Diagram

No mass haul diagram has been provided with the Contract documents. The Contractor shall locate suitable materials for constructing earthworks along the alignment and elsewhere.

511 Borrow Pits

Delete the first paragraph and substitute with the following;

Fill material which is required in addition to that provided by excavation shall be obtained from borrow pits to be located and provided by the Contractor but to the approval of the Engineer.

514 Top Soiling and Grassing

Consider the existing text to be Sub-clause 514.1

The embankments and cut faces referred to in Clause 514.1 of the Standard Specification are synonymous with fill slopes and cut slopes defined in Clause 110 (c) of the same specification.

The guiding dams referred to in Clause 514.1 of the Standard Specification are synonymous with the guiding dams referred to in Clause 817 of the same specification.

Add the following Sub-clause 514.2

514.2 Hydro-seeding

Where it is specified that hydro-seeding should be carried out on topsoil, the thickness of the topsoil shall be 100 mm unless, where suitable soil is present, the Engineer orders the topsoil to be omitted or applied in reduced thickness.

The Engineer and the Contractor shall agree the types and mixtures of seeds to be used on before the Contractor orders any seed he may wish to use. The variety of resulting grass or plants should not be attractive to livestock or grass eating animals.

The Contractor shall be solely responsible for establishing an acceptable grass cover and any approval by the Engineer of seed or seed mixtures intended for use by the Contractor shall not relieve him of this responsibility. All areas to be hydro-seeded or hand seeded shall be scarified forming horizontal drills running parallel to the contours. The drills are to be spaced at intervals of 150 to 250 mm apart. Seeding to Mulch shall be added to the hydro-seeding mix at an approved rate.

Hydro-seeding shall be carried out with an approved hydro-seeding machine at a rate of application of not less than 20 gm/m² for fill and cut slopes and 10 gm/m² for other areas. When the use of anti-erosion compounds is required and such compound is to be applied simultaneously with the hydro-seeding, it shall be mixed with the hydro-seeding mixture before application.

514.3 Application of Chemical Fertilizers

For all areas to be grassed the Contractor shall have the top 150 mm of the prepared surface analyzed to determine the quantity and type of fertilizer that may be required for establishing proper growth conditions for the grass. The locations of soil samples taken shall be indicated on plans by the Contractor. The Contractor shall furnish the Engineer with the soil analysis and subsequent fertilizer recommendations. Only after approval by the Engineer of the nature and quantity of fertilizer may the application proceed.

Soil improvement chemicals and fertilizers shall be made available for application of chemical fertilizer. As such no separate reimbursement to the Contractor shall be made. The Contractor shall be deemed to have included his costs in the rates for top soiling and grassing.

515 Side drains

Whenever excavation works inside drains constitutes a separate operation from the bulk earthworks such excavations shall be classified as catch water drains under Section 8 of the Specification.

517 Measurement and payment

(a) Fill in soft material

Add the following at the end of this item:

Quantities for embankment widening shall be measured using the final compacted volume of filled material over the existing embankment after removal of top soil. No separate payment shall be made to the Contractor for any additional earthworks resulting from his construction methods or for working space for his construction plant and equipment or for complying with the requirements of Clause 504.2 of this specification with respect to benching where necessary. The Contractor shall take this into consideration when preparing his rates.

(c) Spoil in soft material

Add the following at the end of this Item:

The rate for spoil in soft material shall also allow for removal and disposal of material in waterlogged areas. No separate payment shall be made for overhaul.

Add the following:

(n) Item: Providing an approved seed mixture for hydro-seeding

Unit: Kilogramme (kg)

The Unit of measurement shall be the kilogramme of seed of the specified or approved seed mixture provided. The rate shall include the full compensation for procuring and furnishing certified seeds and compliance with Clause 514.2 of this specification.

(o) Item: Hydro-seeding

Unit: Hectare (ha)

The unit of measurement for hydro-seeding shall be the area, measured in hectares of grass established by hydro-seeding which has an acceptable cover. The rate shall include full rate for furnishing cellulose pulp, mixing it with seed, water and with any anti-erosion compound, if required, applying the mixture, watering weeding, reseeding bare patches, and for any other work which may be necessary for establishing an acceptable cover and maintaining the grass.

Add the following to this section. The details apply to both the activities for the quarries and road works.

518 Blasting

518.1 Control Blasting

The rock blasting shall be controlled so that vibration generated during the blasting do not cause damage to the building and installation around built up areas as given in the table below. Similarly the rock pieces should not fly off the pits and thus damage the buildings, installation, life and limb of people around. Apart from the general precautions mentioned in the Standard Specification, the protective measures and limits, stated under Clause 518.2 below for use of explosives are suggested as guidelines. The Contractor shall carefully check the site conditions and submit to the Engineer the details of the scheme he proposes to adopt for controlling the blast.

518.2 Protective Measures

The following precautionary measures, single or in combination, as required by site conditions shall be adopted by the Contractor while carrying out controlled blasting.

- (i) Short delay blasting with light charges shall be used.
- (ii) The blast hole shall be covered with 0.6 m² to 1.0 m² mild steel plate of minimum 6 mm thickness.
- (iii) Reinforcement rod mesh not less than 20 mm dia. at 150 mm centres in both directions shall be placed over the steel plates. Steel plate and reinforcements shall be inspected

after every blasting operation and all twists shall be removed before reuse to the satisfaction of the Engineer.

The thickness of the covering plate and the kind of dead weight is to be duly approved by the Engineer.

When blasting is necessary adjacent to partially or completely built structures the Contractor shall take all precautions necessary to prevent flying rock from causing damage to the structures.

518.3 Blasting Within Certain Limit

No blasting shall be allowed for any of the excavation until freshly placed concrete of nearby structures has reached a minimum strength of 7 N/m².

Normally blasting shall be resorted to only after 7 days of concreting work in case of OPC (10 days in case of PPC) in adjacent structures.

In no case shall blasting be allowed closer than 15 m to any structure after concrete placing has started.

The Contractor shall submit the scheme with charges and delay detonators he proposes to use for blasting for the approval of the Engineer.

(a) Permissible Standards

Depending on the type of structures and the dominant excitation frequency, the permissible peak particle velocity (ppv) due to blast induced ground vibrations adjacent to the structures shall not exceed the values given in the table below.

Permissible Peak Particle Velocity (PPV) at the Foundation Level of Structures in Blasting Areas in mm/s

Type of Structure	Frequency Hz. <i>PPV (mm/sec)</i>		
(a) Buildings/Structures not belong to the owner:			
(i) Domestic houses / Structures (temporary, Brick and Cement)		5	

Type of Structure	Frequency Hz. <i>PPV (mm/sec)</i>		
(ii) Industrial Buildings (RCC and Framed Structures)		10	
(iii) Objects of historical importance and sensitive structures		2	
(b) Buildings belonging to owner with limited span of life:			
(i) Domestic houses/structures (Temporary, brick and Cement)		10	
(ii) Industrial building (RCC and framed structures)		6	

It is generally recommended that where the blasting is to be carried out, within 20 metres of the nearest point of permanent building, the area shall be line drilled on periphery before blasting.

The Contractor shall be responsible for all damage caused by blasting whether to permanent or temporary structures and shall replace or repair the structures at his own cost. The Contractor will have to design the charge per delay to restrict the PPV as indicated above.

518.4 Precautions after Blasting

After the blast, the Contractor's works superintendent must carefully inspect the work and satisfy himself that all the charges have disappeared from the face.

If it is suspected that part of the blast has failed to fire or is delayed, sufficient time shall be allowed to elapse before entering the danger zone. When fuse and blasting caps are used, a safe time should be allowed and then the superintendent alone shall leave the shelter to inspect the blasting zone.

None of the drillers is to work near the misfired hole until one of the two following operations has been carried out by the superintendent:

- (i) The supervisor should very carefully, when the tamping is of damp clay, extract the tamping with a wooden scraper or jet of water or compressed air, Using a pipe of soft material, and withdraw the fuse with the primer and a fresh detonator with fuse should be placed in these holes and fired out, or
- (ii) The hole may be cleared or 30 m of tamping and its direction then be ascertained by placing a stick in the hole. Another hole may then be drilled at least 600 mm away and parallel to it and about 300 mm less in depth. This hole shall then be charged and fired. The balance of the cartridges and detonators found in the muck shall be removed.

Before leaving his work, the superintendent of the concluding shift shall inform the superintendent of the relieving shift of any case of misfires and should point out the position with a red cross denoting the same and also stating what action, if any, he has taken in the matter.

The superintendent should also at once report at the office of the Contractor and the Engineer all cases of misfire, the cause of the same and what steps were taken in connection with these.

The names of the day and night shift superintendents must be noted daily in the Contractors office.

If a misfire has been found to be due to a defective detonator or dynamite the whole quantity or box from which the defective article was taken, must be thoroughly inspected by the Contractor.

Drilling in holes not completely exploded by blasting shall not be permitted.

518.5 Personnel

Excavation by blasting will be permitted only under the personal supervision of competent and licensed blasters and trained workmen.

All superintendents and workmen in-charge of preparation, handling storage and blasting work shall be adequately insured by the Contractor.

Storage shall be under a very reliable person approved by the Engineer, who may, if necessary conduct police enquiries as to his reliability and antecedents. The Contractor shall have to produce a security for the person in-charge of the explosive, if and when required by the Engineer, or the civil authorities of the project road location.

The Contractor shall make sure that his superintendents and workmen are fully conversant with all the rules to be observed in storing, handling and use of the explosives. It shall be imperative that the superintendent in charge is thoroughly acquainted with the details of the handling of explosive and blasting operations.

518.6 Rate of Charge

To establish the safe charge per delay the Contractor will have to demonstrate by necessary instrumentation for the approval of the Engineer.

600 QUARRIES, BORROW PITS, STOCKPILE AND SPOIL AREAS**601 General**

The Employer will not make available to the Contractor any land for quarries, borrow pits, stockpile and spoil areas, except for those in the road reserves and specifically approved by the Engineer.

The Contractor will be entirely responsible for locating and providing suitable sources of materials complying with the specifications and for procurement, winning, haulage to site of these materials, rehabilitating the borrow pits, quarries, stockpile and spoil areas, and all costs involved therein. Similarly, the Contractor will be responsible for provision of areas for stockpiling materials and disposal of spoil dumps or stockpiling within the road reserve. The Contractor may utilize them subject to the approval of the Engineer.

No additional payment will be made to the Contractor to cover costs arising from the requirement of this clause. The Contractor shall include the costs of complying with this clause in the rates and prices inserted elsewhere in the Bill Of Quantities.

602 Definitions

Add the following to Clause 602:

(d) Materials Report

The information on possible material sites is given for the general guidance of bidders. However, bidders are advised to conduct their own investigation as the information contained therein is neither guaranteed nor warranted.

700 EXCAVATION AND FILLING FOR STRUCTURES**703 Excavation of foundations for structures**

Make amendments to this clause as follows

Read the second paragraph as “unless otherwise instructed by the Engineer, all excavated surfaces in material other than hard material, on which foundations for structures shall be placed, shall be compacted to 100% MDD (AASHTO T.99) immediately before structures are constructed.

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

Add the following to this clause:

703.1 Preparation of Foundation and Approval**(a) Preparation of Foundation**

The bottom of foundations shall be levelled both longitudinally and transversely or stepped as directed by the Engineer. Where the material met with is other than rock, the same shall be compacted to at least 95% MDD. Where rock and soil are met with in part widths, the area in the soil portion shall be sub-excavated to a depth of 100 mm and backfilled with Class 15/20 concrete. All rock faces shall be freed of soft and loose material, cleared and cut to a firm surface, level, stepped or serrated as directed by the Engineer. All seams shall be cleared out and filled with cement mortar, to the satisfaction of the Engineer.

(b) Approval of Foundation

After excavation in each location is completed, the Contractor shall notify the Engineer, and no foundation concrete shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

703a Erosion Protection Works at Upstream and Downstream of Culverts/Bridges**703a.1 Scope**

The work shall consist of provision of erosion protection works in the form of bed flooring and curtain or cut-off walls at the upstream and downstream ends of the new as well as the existing box/pipe culverts. The work shall be carried out to such designs and at such locations as indicated on the Drawings or as directed by the Engineer.

The erosion protection works shall consist of dry rubble stone bed flooring and random rubble masonry curtain (cut-off) wall at the upstream and downstream ends of box/pipe culverts.

703a.2 Materials

The material for bed flooring shall be dry rubble stone, each stone weighing not less than 40 kg.

The curtain wall shall be constructed of random rubble masonry in cement mortar of 1:3.

703a.3 Construction Operations

(a) Curtain Wall

The trench for the curtain wall shall be excavated as per Clause 703 of the Standard Specification at such locations and to such depths shown on the Drawings or as directed by the Engineer. After preparing the foundation bed, the curtain wall shall be constructed to the thickness shown on the Drawings and to levels up to top of the bed flooring.

(b) Floor Paving

The bed for the flooring shall be prepared by excavation in accordance with Clause 703 of the Standard Specification or filling in accordance with Clause 707 of the same specification, levelled and compacted to at least 98% MDD. The top of bed shall be prepared to such levels that after construction of the bed flooring, it is in line with the invert of the culvert barrel and sloping away. The bed flooring shall end before the curtain wall.

707 Backfilling of Excavations and Filling for structures

Make amendments to this clause as follows

Delete “95% where ever it appears and insert “100%”.

708 Protection of Structures

Add the following to Clause 708.

Unless specific provisions for any structure in respect of cofferdams has been made in the Bill of Quantities, no payment will be made for the erection, maintenance and removal of cofferdams and the Contractor’s rates shall be deemed to be all inclusive.

709 Excavations for River Training and New Watercourses

Add the following to Clause 709:

For culvert widening the Contractor shall inspect the structures to be widened and allow for any river training works he deems necessary in his rates for excavation.

710 Stone Pitching

Add the following to Clause 710:

Stone pitching to drains, inlets and outlets of culverts to embankments and around structures shall consist of sound un-weathered rock approved by the Engineer.

All stone for pitching shall be capable of withstanding a crushing stress of 20 N/mm² when soaked. The source of stone shall be free from overburden, mudstone, cracks, sand holes, veins, laminations or other imperfections as may be identified by the Engineer during the approval process.

The surface to receive the pitching shall be compacted and trimmed to slope and the stone laid, interlocked and rammed into the material to give an even finished surface.

In areas where stone pitching has been damaged, the Contractor shall identify such areas and notify the Engineer for his agreement of the extent of the Works required and his approval and instructions to proceed with the Works. Stone pitching repair and reconstruction shall be carried out in accordance with Clause 710 of the Standard Specification. The Works shall involve removal of the damaged stone pitching and reconstruction of the said areas in accordance with Clause 710 of the Standard Specification by the use of the sound salvaged material together with any necessary additional material where all such materials shall comply with Section 7 of the Standard Specification

800 CULVERT AND DRAINAGE WORKS**804 Excavation for Culverts and Drainage Works**

In the Standard Specification make the following amendments on this clause:

In paragraph 6, line 3, in paragraph 7, line 5 and in paragraph 11, line 6, delete reference to “95%” and insert “100%”.

805 Excavation in Hard Material

In the Standard Specification, sub-clause 805 (a) and (b) delete reference to “95%” and insert “100%”.

809 Bedding and Laying of Pipe Culverts

In the Standard Specification, sub-clause 809 (a), delete reference to “95%” and insert “100%”.

Add the following to Clause 809:

(d) Laying, Bedding and Surround for Culverts Cast In-situ

In addition to the requirements of the Standard Specification, where inflatable balloon method of casting culverts in-situ is used, it is essential that thorough pre-construction trials are carried out and necessary adjustments made to ensure that:

- (i) All concrete used for surround and the top 50 mm or 80 mm of bedding for culverts size 600 mm and 900 mm internal diameters respectively shall be Class 30/20 while the rest of the concrete shall be class 20/20.
- (ii) The inner concrete barrel surface immediately in contact with the inflated balloon form during placing shall achieve Class F3 finish.

810 Jointing Concrete Pipes

In addition to the requirement of Clause 810 of the Standard Specification, all precast concrete pipes shall be ogee jointed pipes laid with a 1:2 (cement: sand) mortar and provided with fillets on the outside and as described in the Standard Specification.

812 Backfill

In the Standard Specification make the following amendments to this clause:

- (a) Wherever the expression “dry density of 95% (AASHTO T99)” occurs, this expression shall be deleted and replaced with “dry density of 100% (AASHTO T99)”.

- (b) Delete paragraph 6: “For pipes culverts...depth of 150 mm”, entirely.

816 Minor Drainage Structures

Add the following to this clause:

(a) Concrete Lined Drains

The exposed surfaces of concrete lined drains shall be a class UF2 finish. Concrete lined drains shall be constructed to the same standard as the minor drainage structures.

(b) Cast in situ chutes on side slopes

Where pre cast chutes are provided, refer to Section 1 of this the specifications.

817 Mitre Drains, Cut-off Drains, Catch Water/Drains, Outfall Drains and Earth Dams

Rename the existing text as 817.1 and add the following sub-clauses:

817.2 Cleaning Existing Drains

Where instructed by the Engineer, the Contractor shall clear blocked side drains and/or outfall drains to a free flowing condition. The work shall consist of but not be limited to:

- Stripping and removal of extraneous material including vegetation and roots to spoil
- Carting away and spreading any spoil to the satisfaction of the Engineer, and
- Reshaping the drains to a free flowing profile.

817.3 Cleaning of Hydraulic Structures

Where instructed by the Engineer, the Contractor shall clean the existing hydraulic structures by removing all undesirable material in the structures to ensure they are clean and free flowing. The Contractor shall dispose of all the silt and other undesirable material to spoil. After the cleaning out of structures, the Contractor shall be responsible for maintaining the hydraulic structures in a clean condition for the duration of the Contract.

817.4 Removal of Existing Pipes, Inlet and Outlet Structures

The Contractor shall remove existing concrete pipes where instructed by the Engineer including bedding, surround, inlet and outlet structures. Concrete shall be disposed of as directed by the Engineer. Masonry structures where in a good condition shall be preserved to reuse as may be directed by the Engineer. Additional material shall be added to the void left after removal of these pipes and structures and shall be carefully compacted to 100% MDD

(T99). The void shall then be preserved for placement of any new pipes or construction of new structures.

The existing inlet and outlets structures, where in good condition, and reusable as beds to pipe extensions, shall not be removed. Any such structures removed without the Engineer's approval shall be restored to the original condition at the Contractor's expense.

817.5 Extension of Existing Pipes

Where shown on the drawings or instructed by the Engineer, the Contractor shall extend the existing concrete pipes. Part of the existing pipe surround shall be broken and concrete collar constructed as shown on the drawings. The extension shall be backfilled to the same standards as for new pipes.

817.6 Chute drain for High Embankment Sections

(a) Scope

This work shall consist of construction of chute drain on the slope of the road embankment including erosion protection works at the locations and to dimensions shown on the Drawings or as directed by Engineer. The schedule of works shall be so arranged that the drains are completed in proper sequence with roadway to ensure that no damage is caused due to lack of drainage.

(b) Materials

The drains shall be of half round pipe of 600 mm dia. formed by joining pre-cast semicircular RCC sections at site as shown in the drawings. The RCC work shall conform to the relevant clauses of these specifications.

The toe wall below ground level shall be of brick masonry in cement mortar 1:4 or plain cement concrete of class 15/20, as shown on the Drawings.

Dumped riprap for erosion protection at ground level shall be hard, unweathered and durable rubble stone of size 150 mm to 250 mm.

(c) Construction Operations

Excavation for fixing drain sections at the locations where the chute drains are to be installed, a semi-circular cut on the side slope of the embankment along the line of the chute drain shall be made in such a way that the RCC drain sections could be fixed

snugly with their edges flush with the adjoining embankment slope. The sloping bed of the drain shall be to a regular line and suitably compacted to provide a firm bed.

817.7 Stone Masonry and Concrete Paving

(a) Description

The work shall consist of construction of lined ditches, stone paved shoulders, hard strips, chutes, toe walls, retaining walls, slab culvert walls, head walls, wing walls, aprons and slope protection works using natural stones for stone related masonry and precast concrete blocks for concrete block masonry set in cement mortar.

(b) Materials

(i) Stones

Stones used shall be hard and durable without weak seams or cracks and of rectangular shape. The Los Angeles Abrasion Value shall not exceed 50. The apparent specific gravity shall not be less than 2.2 and water absorption when tested in accordance with AASHTO T85 shall not exceed 5 percent.

(ii) Concrete Blocks

Concrete blocks for concrete block masonry shall be precast from Class 20/20 concrete while those used for paving shall be in Class 25/20 concrete. The blocks shall, in general, have the length, width and height in the proportion of 3:1.5:1 or as ordered by the Engineer. The blocks shall be moist cured for at least 7 days, and kept under cover for another 21 days in the casting bed before being lifted for use in the works. The blocks when tested flat after 28 days of casting shall have a compressive strength not less than 125 percent of the cylindrical compressive strength specified for the class of concrete used.

(iii) Mortar

The mortar shall be made of a mixture of cement and sand in the proportion of one cement to three sand. Cement shall be Portland cement conforming to AASHTO M85, Type I or II. The sand shall be crushed stone or natural sand or a combination thereof conforming to AASHTO M45. Water added shall be just adequate for making a workable mix and shall be subject to the approval of the Engineer.

(c) Construction Requirements

(i) Stone Masonry

The stone masonry shall be used for walls of different types above the ground level. The stones shall be of regular shape with length of any stone not exceeding 3 times its height, with the breadth on the bed not less than 150 mm nor greater than three quarters of the thickness of the wall. Unless otherwise directed, the stone shall have thickness not less than 150 mm.

All stone possessing bedding planes shall be laid with its natural bed as nearly as possible at right angles to the direction of the load, and in case of arch rings, the natural bed shall be radial.

Each course shall present a uniform horizontal line of more or less equal height. Vertical joints shall be broken by the adjoining courses. All joints shall be sufficiently thick to prevent stone to stone contact and shall be completely filled with mortar. On the exposed face no part of the masonry shall deviate from the general line of the wall by more than 20 mm.

Walls of stone masonry shall be provided with weep holes as shown on the Drawings or directed by the Engineer. In continuous long structures, expansion joints shall be formed as shown on the Drawings subject to a minimum spacing of 10 m.

All face joints shall be finished almost flush with the surface of the work without covering the stones. The top surface of all walls shall be provided with 20 mm thick cement mortar coping with a crossfall for shedding rainwater.

Newly laid masonry shall be protected against the harmful effects of weather and cured for a minimum period of 4 days. All visible surfaces of the masonry shall be clean and free from mortar stains and other blemishes.

Backfill behind the stone masonry walls shall be placed only after the masonry work has been in place for at least 14 days or as directed by the Engineer.

(ii) Grouted Stone Riprap

This type of masonry that is constructed in a single layer over a bed of mortar shall be used for shoulder paving, hard strips, aprons, drainage chutes, lined ditches and slope protection. The stone shall be of regular shape and uniform thickness. Prior to laying of the stone, the base shall be brought to regular shape and levels, watered and well compacted. Where this type of masonry is to be used for paving shoulders or for carriageway widening of the existing roads, the base shall be slightly loosened, watered and compacted to 95% MDD prior to application of the riprap. The stone shall be placed over a bed of mortar about 20 mm thick. After placement of the stones by hand, all the joints shall be completely filled with cement mortar. The finished work shall present a uniform surface with no point deviating from the general line by more than 10 mm in the case of shoulder paving, and hard strips, and not more than 25 mm in other cases. The finished work shall be protected against the adverse effects of weather and cured for at least 4 days.

(iii) Dry Stone Riprap

This work shall consist of placing 150 mm to 300 mm size rubble stone on the front side of cut-off walls of culverts and Irish Crossings as erosion protection measure. The dimensions of the riprap construction shall be as shown on the drawings or as directed by the Engineer. The stone used shall be of hard and durable type as are used for stone/boulder masonry. The stone shall be so placed that major hollow spaces are avoided.

(d) Measurement and Payment

(i) Stone Masonry

The quantity to be paid will be measured by volume in m³ of stone masonry complete in place and accepted. In computing the volume for payment, the dimensions used will be limited to those shown on the Drawings or ordered in writing by the Engineer.

No deductions will be made for weep holes, drainpipe or other openings of less than 0.2 m² in the area. The cement mortar coping on top of the wall shall be included in the measurement for stone masonry.

If the masonry is for heightening or lengthening an existing wall, the work of removing the plaster, if any, on the old wall including roughening of the surface to effect good bonding shall be considered incidental to the work and shall not be paid for separately.

The quantities of excavation below ground level and backfilling will be measured as structural excavation.

(ii) Grouted Stone and Dry Stone Riprap

Grouted Stone Riprap shall be measured by m² of completed and accepted work placed to the specific thickness. Measurement shall be limited to the dimensions shown on the Drawings or as otherwise authorised by the Engineer. No measurement shall be made of unauthorised areas or for extra thickness. Toe walls and cut-off walls below ground level shall be measured in m³ and paid for as Boulder Masonry.

Where the rip-rap is used for shoulder paving or for widening carriageway of existing road, the bed preparation shall be measured as sub-grade preparation in accordance with Clause 508 of the Standard Specification. In all the other cases, slope and bed preparation shall not be measured for payment but will be considered subsidiary to the pay item.

Dry Stone Riprap shall be measured as placed in position in m³. Any excavation for making space for placing the riprap shall be measured as common excavation in accordance to Clauses 504 and 505 of the Standard Specification.

(iii) Payment

The amount of completed and accepted work as measured will be paid for at the bid unit prices per m³ for “Stone Masonry”, “Dry Stone Riprap” and “Grouted stone riprap”, used for shoulder paving, hard strips, ditch lining, aprons, drainage chutes and slope paving. These prices shall be in full compensation for furnishing and placing all materials, and for all labour, equipment, tools and incidentals necessary for completion of the work complying with the specifications.

Add the following to Clause 819 of the Standard Specification:

819.1 Repair of Drainage Spouts

The repair of drainage spouts shall be made by cleaning of the existing drainage pipes of all muck and replacing the broken pipes or by providing new drainage spouts in cases where the same have not been provided.

(a) Materials

- (i) Ordinary Portland cement KS 1825
- (ii) Aggregates conforming to BS 5328
- (iii) GI Pipes
- (iv) Paint.

(b) Equipment

- (i) Welding equipment
- (ii) Painting brushes
- (iii) Miscellaneous construction equipment

(c) Procedure

The existing drainage spouts shall be cleaned of all muck. The new GI drainage spouts shall then be replaced for the damaged spouts as per the detailed drawings.

In case where drainage spouts have not been provided, the RCC kerb shall be cast after fixing new pipes as per the detailed drawings. The casting of concrete and fixing of pipes shall be made as per the standard practice.

The GI drainage spouts shall be painted with black anticorrosive paint of approved brand and manufacture to give an even shade.

The existing reinforcement shall be realigned and additional reinforcement shall be provided as per the drawings or as directed by the Engineer.

Concrete shall be mixed and laid as per the standard practice and as per the drawings. For bonding old concrete with the new concrete, the old concrete surface shall be painted with epoxy bonding agent or polymer cement slurry before the concreting is cast.

820 Measurement and Payments for Additional Items

- (a) **Item: Concrete for top 50 mm or 80 mm bedding and surround for culverts cast in situ.**

Unit: m³

The rate for concrete for each size of culverts instructed shall include for the cubic metre of the top 50 mm or 80 mm of concrete for bedding and surrounds, as instructed, calculated from the dimensions on the drawings or as directed by the Engineer.

The rate for concrete for bedding and surrounds for culverts cast in situ shall include for the cost of providing and placing the concrete and complying with Clauses 809, 810, 814, 819 and 1713 of the Standard Specification.

No extra payment shall be made for provision of inflatable forms and other requirements for casting culverts in-situ and the Contractor shall be deemed to have provided for these in his rates.

- (b) **Item: Cleaning and grading the existing outfall and metre drains**

Unit: m³

Cleaning the existing drains shall be measured by the volume instructed. The volume shall be the product of the cross sectional area of the material to be removed from the drain and the length instructed.

- (c) **Item: Removal of material from existing side drains**

Unit: m³

Cleaning of the existing drains shall be measured by the volume instructed. The volume shall be the product of the cross sectional area of the drain to be cleaned and the length instructed. Payment will not be made under this item where the material can be removed in conjunction with bulk earthworks.

- (d) **Item: Removal of the existing pipes**

Unit: m³

Removal of the existing pipes shall be measured by the length of culvert removed. It shall include for breaking out where necessary and carting of the removed culvert and

surrounds to spoil or stockpile as shall be directed by the Engineer. It shall also include all the costs of complying with the requirements of Clause 817.3.

(v) Item: Demolition of inlet and outlet structures

Unit: m³ of concrete or masonry

Demolition of inlet and outlet structures shall be measured by the volume of concrete or of masonry structures demolished. There will be no distinction between reinforced and un-reinforced concrete structures. The rate shall include for disposal of concrete and reuse of masonry as directed by the Engineer. Stone pitching shall not be measured separately and where it is to be removed shall be treated as normal site clearance.

(w) Item: Cleaning the existing hydraulic structures

Unit: m³

Cleaning of the existing hydraulic structures shall be measured by the volume of material removed. The rate shall include for the cost of removing all undesirable material, transporting and disposing off as well as the additional costs of gaining access to the structures as specified and maintaining the structures in a clean condition.

(x) Item: Concrete collar

Unit m³

Reinforced concrete collars shall be measured by the volume of concrete placed as shown on the drawings or instructed by the Engineer.

Where the existing culvert which is to be extended has a concrete surround, the rate shall also include for removal of this surround for the length of the collar to be placed around the existing culvert.

In all cases the rate shall also include for excavation below the culvert and the preparation and compaction of the in situ material to form a bed for the collar.

821 Cement Mortared Stone Masonry Walls

Masonry walling shall be constructed with sound clean stone with a minimum width of 200 mm. The stone shall have a fair finish. The stone shall be individually placed to break joint and to provide a minimum of voids. The stone shall be wetted and jointed in a 3:1 (sand: cement) mortar. Exposed stone on the wall faces shall be cleaned of mortar by washing or wire brushing. The mortar shall be flush pointed to the approval of the engineer.

Weep holes shall be provided as instructed and shall be cleaned of mortar and any other clogging material that may have entered during construction.

The walling shall be protected from the weather and kept moist for a minimum of seven (7) days after completion.

822 Subsoil Filter Drains

The Contractor shall lay subsoil filter drains where shown on the drawings or instructed by the Engineer. The drain shall extend to the underside of the sub-grade or sub-base and shall consist of a perforated pipe wrapped in geotextile fabric as specified in the Standard Specifications and shown on the drawings. The pipe and fabric shall be laid on and backfilled with granular filter materials. The granular material shall comply with the requirements given in the table below.

BS Sieve Size (mm)	Percentage by mass Passing Sieve	
	Minimum	Maximum
37.5	100	100
20	85	100
10	50	100
5	35	90
1.18	15	50
0.600	5	35
0.150	0	5

823 Gulley Pots and Chambers

Where shown on the drawings or instructed by the Engineer, the existing roadside gulleys and gulley pots shall be adjusted before laying final wearing course such that there are no depressions around man holes, gulleys or chambers. The beds, frames and haunches shall be adjusted with concrete Class 20/20 true to line and level and to the satisfaction of Engineer.

824 Pedestrian Crossings

Where shown on the drawings or instructed by the Engineer, the Contractor shall construct pedestrian crossings across open drains. The crossing will be 2 m wide, with culverts located

as directed by the Engineer. The pedestrian crossing shall be finished to the same standards as the adjacent footpath. Where there is no footpath, the crossing shall be finished with approach path comprising 150 mm gravel base with surface dressing similar to the adjacent shoulder as directed by the Engineer.

825 Measurement and Payment for Further Additional Items

(a) Item: Preparation of bed for concrete lined open drains

Unit: m²

The unit of measurements shall be the square metre of excavation trimmed to receive concrete lining. The rate shall include for all the excavation below the finished line of the drain, providing and laying of gravel bed, and compacting and shaping to the line and level required to receive the concrete lining.

(b) Item: Cast in situ concrete chutes

Unit: m³

Cast in situ shall be read as “Pre-cast”. Pre-Cast concrete chutes shall be measured by the volume of concrete cast. The rate shall include for preparation of sides, laying, fixing and for complying with the requirements of Sections 8 and 17 of the Standard Specification.

900 PASSAGE OF TRAFFIC**903 Maintenance of Existing Road**

Amend as follows:

The Engineer shall hand over the existing road to the contractor, in sections, at the commencement of the Contract for construction purpose. However, the Contractor shall be responsible for all repairs and maintenance of the entire road package for the duration of the Contract. The existing road is bituminous and the Contractor shall maintain it with asphalt materials or other materials similar to those of the existing pavement layers. The Contractor shall regularly inspect the road and carry out such repairs and maintenance to the satisfaction of the Engineer. If at any time the Engineer draws the Contractor's attention to a road section which requires maintenance the Contractor shall promptly repair the section. The Contractor shall be legally responsible for any accident or damage attributable to his failure to maintain the road.

Add the following to this clause:

903.1 Maintenance of Right of Way

Throughout the period of the Contract the Contractor shall at all times maintain public vehicular access to the right of way, within the right of way and from the right of way to all public and private land, as it was immediately prior to his commencement of the Works.

The Contractor may, on submission of written request to the Engineer, including a drawing, programme and specification, be given approval to operate:

- (a) A road diversion suitable for the road traffic and suitable width or
- (b) Traffic on a one way system using manual coordinated direction control or automatic traffic lights having a secure source of power.

Applications for approval shall show every detail of the proposals including road construction cross section including pavement, surfacing, profile and drainage, road signing, communication between the ends of the controlled section lighting and the proposed period of operation.

One way systems shall be provided with adequate sign posting and the Contractor shall limit delays to any traffic to the minimum and with the approval of the Engineer. The travelling public shall be notified by signs, of exceptional delay well in advance of the site of delay, as required by the Engineer.

Payment for temporary diversions, traffic provisions and maintenance of roadways shall be as provided in the Contract and as instructed by the Engineer.

904 Construction of Deviations

Add the following paragraph between the second and the third paragraphs of Item (a):

The Contractor shall programme his works in such a way that traffic shall not be required to pass over more than 1.5 km at any one time unless otherwise approved by the Engineer. There will be construction of 2km road to bitumen standards to be used as diversion and payment will be done using relevant bill items.

906 Passage of Traffic through the Works

Add the following to this Clause.

The Contractor shall be deemed to have inspected the site and satisfied himself as to the adequacy of his bid for these works and no additional payments will be made for any expenditure on traffic control. Should the Contractor propose any other method of passage of traffic including construction of traffic deviations and use of the existing roads the Contractor shall investigate the alternatives, construct and maintain them to the satisfaction of the Engineer. The Employer shall not be liable for investigations or costs arising from the alternatives methods of traffic control proposed by the Contractor. Deviations or other measures for traffic control where proposed by the Contractor shall meet the requirements of the specifications and drawings and be approved by the Engineer.

The Contractor shall ensure that the workforce and site supervisory staff at all times wear high visibility garments when work is carried out on or adjacent to a section of the road open to traffic. The Contractor shall ensure that the supervisor or person in charge of the work force is readily recognized from the rest of the workforce. In addition, the Contractor shall provide a full time traffic safety officer to coordinate aspects of road safety for the whole site.

The Contractor shall be deemed to have included all costs related to employing the traffic safety officer and for all the duties performed by him in his rate for passage of traffic.

912 Measurement and payment

(a) Item: Construction of Deviation

Amend as follows:

The rate for construction of deviation shall include provision, placing, forming and compaction of gravel sub-base, stone base and bituminous wearing courses.

(b) Item: Provide and Maintain Road Signages

Unit: Lump Sum

Payment of the lump sum shall be through equal monthly instalments over the period of the Contract on a pro rata basis subject to the approval of Engineer.

(b) Item: Maintain existing Roads and deviations

Unit: Lump Sum

Payment of the lump sum shall be paid per kilo metre length the period of the Contract, excluding the Defects Liability Period provided that the total sum of instalments paid shall not exceed the lump sum; and

- (i) If any month the Engineer is not fully satisfied that the Contractor has fully complied with all the provisions of this sub-section, the Employer shall withhold the whole of the instalments due to the Contractor and the Engineer shall, in addition, deduct from any monies due to the Contractor a sum of Kshs 150,000 per day for the period of non-compliance from the date of the Engineer's notice for that month.
- (ii) Where notified by the Engineer the contractor shall complete maintenance on a section or sections of the road so notified within 14 days. Provided further that, if the Contractor fails to complete maintenance on any section within 14 days of the Engineer's notification thereof, the Engineer shall deduct Kshs. 200,000 for delay per day.

(c) Item: Reinstatement of Deviations

In the first paragraph of Clause 912 (h), delete the words "by the lump sum stated in the Special Specification" and replace with 'as described under Item 9.04 of the Bill of Quantities'.

1100 SHOULDERS AND FOOTPATHS

Add the following to this section:

1107 Footpaths

Where shown on the drawings or directed by the Engineer, footpaths shall be constructed. The Footpaths shall be constructed using the precast concrete paving blocks as the finish or asphalt or gravel wearing course. The line of the footpaths shall be as shown on the drawings or as directed by the Engineer.

1107.1 Pre-cast Concrete Paving Blocks

Precast concrete blocks shall be hydraulically pressed, complying with BS 7263: Part 1. Blocks shall be laid in accordance with BS 7263: Part 2 to the required cross fall.

1107.2 Flexible Surfacing for Footpaths and other Paved Areas

Flexible surfacing for footpaths and paved areas shall be laid in compliance with section 16 of the Standard Specification.

Surfacing shall be laid true to level and cross fall as shown on the drawing or instructed by the Engineer. Payments for flexible surfacing on footpaths will be measured and paid in accordance with the provisions of section 16 of Standard Specification.

1108 Measurement and Pavement**(a) Item: Precast Concrete Paving Blocks**

Unit: m²

Precast concrete blocks shall be paid by the area measured on plan. The rate shall include for supplying, laying the bedding, jointing, compacting, laying at kerbs and radii and all the Contractor's obligations with respect to this clause.

12.00 NATURAL MATERIAL SUBBASE AND BASE

1201 MATERIAL REQUIREMENTS

Natural materials for base and subbase shall conform to the specifications given in Section 12 of the Standard Specifications for Road and Bridge Construction for cement and lime improved base and subbase.

1202 MEASUREMENT AND PAYMENT

Natural material for subbase and base shall be measured by the cubic metre placed and compacted upon the road calculated as the product of the compacted sectional area laid and the length.

Measurement and payment of natural materials for subbase shall be in conformity with Method A of the Standard Specification with the following amendment

Delete “Free haul of 1.5km” whenever it is referred to under this Clause. No separate payment shall be made for overhaul in this contract.

1300 GRADED CRUSHED STONE SUBBASE**1303 Material requirements**

The material for graded crushed stone Sub-base shall comply with requirements for Sub-base stone Class B 0/40. After compaction and compliance with the requirements of Clause 1403 of this specification below, the Sub-base/Base graded crushed stone material shall have a maximum of 8% of particles smaller than 0.075 mm and the resultant layer shall comply with all requirements of Section 13 of the Standard Specification.

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

1306 Laying and Compacting Graded Crushed Stone Sub-base

Graded crushed stone shall be laid by a paving machine.

Add the following to this section:

1311 In Situ Reprocessing of Graded Crushed Stone

In pavement reconstruction sections with an existing graded crushed stone base, the existing graded crushed stone shall be used in pavement and shoulder construction. The bituminous layer shall be removed to spoil or for recycling as instructed by the Engineer, leaving in place the existing graded crushed stone base in situ. After removal of surfacing, the graded crushed stone shall be jointly inspected by the Engineer and Contractor and any contaminated material re-used in earthworks, deviations or disposed off in manner approved by the Engineer. Where the contaminated layer extends into a lower pavement layer, the Existing sub-base or sub-grade layer shall be reworked and re-compacted before reprocessing the graded crushed stone layer. Before addition of any stone material the existing surface shall be lightly compacted to remove undulations and levels taken. The Contractor shall confirm the grading of the stone material and shall add imported material, mixed in such a manner that the reprocessed material shall comply with the requirements of Clause 1303 of the Standard Specification. The material shall be scarified, mixed, watered, spread and compacted as sub-base or base in the carriageway and/or shoulders as shown on the drawings or directed by the Engineer.

1400 CEMENT TREATED MATERIALS**1403 Cement Treatment**

Cement for improvement shall be Ordinary Portland Cement complying with Clause 207 of the Standard Specification. The cement content of the improved graded crushed stone material will be in the range of 1% to 2% by weight. The actual cement content requirement will be determined on site as directed by the Engineer after laboratory and site trials.

14A LEAN CONCRETE**14A/04 Mix Requirements****(i) Proportions**

The ratio of cement to aggregate shall be 3% by weight (including any absorbed moisture but excluding free water in the aggregate).

14A/05 Method of Construction**(i) Curing**

Add the following to this Clause:

The lean concrete shall be protected from injuries action by sun, rain, flowing water, frost, or mechanical injury. At completion of finishing and at the time the concrete surface has hardened enough to prevent the surface being marred by the curing material it shall be cured by one or more of the following methods:

Moist Curing: Wet the concrete surface with a fine spray of water and cover with water proof paper, polythene-coated burlap, or polythene sheeting. Thoroughly saturate polythene-coated burlap with water before placing. Select size of sheets that are at least 300 mm longer than necessary to cover the entire width and edges of base. Place sheets with light coloured side up. Overlap adjacent sheets not less than 300 mm with the lapped edges securely weighed down or the sheets lapped 150 mm and cemented or tampered to form a continuous cover and closed joint. Place the weight on the cover down to prevent displacement or billowing from winds. Fold coverings down over the exposed edges and secure with a continuous bank of earth or other approved means. Use covers in good condition when placed and immediately repair tears and holes they occur during the 7-day curing period.

Liquid Membrane-forming Compound Curing: Apply compound immediately after surface loses its water sheen and has a dull appearance. The curing membrane method should conform to AASHTO M 148. Mechanically agitate curing compound during use. Apply at maximum rate of 5.0 square meters per litre of compound. If compound lacks uniform continuous coherent films or exhibits checks, cracks, peels, or pinholes, apply an additional coat of compound to areas where films is defective. Have readily available impervious sheet curing for use to protect freshly placed concrete in the event that conditions occur to prevent correct application of compound at the proper time. Re-spray surfaces with curing compound after rainfall. Apply at the same rate required above.

The concrete surfaces shall be protected from foot and vehicular traffic and other sources of abrasion for a minimum of 72 hours. The curing method adopted shall be maintained for the entire curing period.

14A/08 Measurements and payment

(a) Item: Curing lean concrete

Unit: m²

The unit of measurement shall be the area of surface cured satisfactorily. The rate shall allow for complying with Section 14A of the Standard Specification.

1500 BITUMINOUS SURFACE TREATMENTS AND SURFACE DRESSING**1502B Materials for Prime Coat and Tack Coat**

- (i) The binder for prime coat shall be MC 70 cutback bitumen. This shall be applied over granular surface to receive any bituminous layer.
- (ii) The binder for tack coat shall be K1-60 bitumen emulsion. This shall be applied over bituminous surface to receive further bituminous layer. A tack coat shall also be applied on prime coat, which has lost its adhesive properties due to contamination, long exposure or weathering before receiving bituminous layer. Such an application shall be made without additional expenditure by the Employer, unless it is required due to reasons outside the Contractor's control.

1504B Spraying of Prime Coat and Tack Coat

- (i) The rate of application of prime coat shall be from 1.0 to 1.2 litres/m². The exact quantity to be applied may be varied within these limits to suit field conditions and will be determined from trials by the Contractor and approved by the Engineer.
- (ii) The rate of application of the tack coat on bituminous surface shall be 0.3 to 0.8 litres/m². The exact quantity to be applied may be varied within these limits to suit field conditions and will be determined from trials by the Contractor and approved by the Engineer.

1502C Materials for Surface Dressing**(a) Binder**

The binder shall be 80/100 penetration bitumen.

(b) Chippings

- (i) Hardness, soundness, shape and cleanliness

Stone for surface dressing on the carriageway and shoulders shall be class 1. Should it be necessary and in the Engineers opinion to clean chippings before laying, the Contractor will wash the chippings to the satisfaction of the Engineer and no extra payment will be made for this operation.

1503C Rate of Application of Binder and Chippings

Rates of spray of bituminous binder and spread rates for chippings shall be as stated in the relevant items in the Bill of Quantities or as instructed by the Engineer. The exact rate to be applied may be varied to suit field conditions and will be proposed by the Contractor for the agreement of the Engineer.

Should any change occur in the nature of source of chippings or binder, the Contractor shall advise the Engineer accordingly who will then decide if new field trials are necessary and if any revisions are required to the spray and spread rates.

Payments for binder and chippings will be based on instructed rates.

1505C Pre-coated chippings

Where shown on the drawings or instructed by the Engineer, chippings used for surface dressing shall be pre-coated. The bituminous binder used for pre-coating shall be A3 anionic bitumen emulsion.

The chippings shall be completely coated with the binder at a nominal rate of 0.4% - 0.8% by dry weight of chippings. The actual rate of application should be as instructed by the Engineer following the Contractor's field trials.

The mixing plant shall comply with the requirements of Clause 1603A, Parts (a) and (b), of the Standard Specification.

The binder shall be heated so that it can be distributed uniformly and care shall be taken not to overheat it. The temperature shall at no time exceed 35°C.

The chippings shall be washed (if necessary) dried and heated so that they are mixed at a temperature of between 20°C and 35°C. The binder shall be introduced in the mixer in the amount specified and the materials mixed until a complete and uniform coating of the chippings is obtained.

Should any change occur in the nature of source of chipping or binder the Contractor shall advise the Engineer accordingly who will then decide if new field trials are necessary and if any revisions are required to the spray and spread rates.

1508C Application of Surface Dressing

At the joint between the shoulder and carriageway, each layer of surface dressing on the carriageway shall be extended 100 mm into the shoulder. In like manner each layer of surface dressing on the shoulder shall also be extended 100 mm into the carriageway. The Contractor shall allow in his rates for this overlap. No additional payment will be made for either the binder or the chippings when complying with this requirement.

1509C Aftercare and Control of Traffic

Surface dressing shall not be trafficked for at least seven (7) days. Where the surface dressing is to be applied to new asphalt concrete, a minimum period of 72 days must elapse before commencing the surface dressing.

1511C Measurement and Payment**(c) Item: Pre-coated chippings**

Unit: m³ of each nominal size of each class

Pre-coated chippings shall be measured by the cubic metre of each nominal size for each class calculated as the product of the area in square metres instructed to be covered and the reciprocal of the instructed rate of application in m² per M³ or the actual rate of application in m² per m³ whichever calculation gives the lower volume.

The rate for chipping shall include for the cost of providing and hauling the chippings and bitumen pre-coating the chippings with bitumen at the instructed rates, spreading and rolling the chippings at the instructed application rate, all hauls as necessary and complying with parts A and C of Section 15.

1600 BITUMINOUS MIX BASES, BINDER COURSES AND WEARING COURSES**1600A GENERAL****1603A Construction Plant****(a) Compaction Plant**

To achieve specified densities it is expected that vibrating rollers will be required to achieve satisfactory results. It is essential that thorough pre-construction trials be carried out to ensure that the vibrating rollers are set up at the optimum amplitude and frequency for the material being laid that they do not break down aggregate particles and that the optimum compaction temperatures are established to allow compaction without creating ripple effects or other distortions of the surfacing.

1606A Site trials

Delete the second paragraph and insert the following:

The trials shall be carried out to:

- (a) Test materials designed in the laboratory so that a workable mix, which satisfies the specified requirements can be selected.
- (b) Enable the Contractor to demonstrate the suitability of his mixing and compaction equipment to provide and compact the material to the specified density and to confirm that the other specified requirements of the completed asphalt pavement layer can be achieved.

Renumber paragraph 5 from “(v)-(vi)” to read “(v)-(viii)”.

1607A Mixing of Aggregates and Bitumen

Delete the second and third paragraphs and then add the following:

The aggregates minus the filler prepared as specified above shall be accurately weighed and conveyed into the mixer in proportionate amounts of each aggregate size required to meet the job-mix formula. The required amount of bitumen for each batch shall be introduced into the mixer in batch mixing. The bitumen shall be added after the aggregates have been introduced into the mixer and mixed for 5 to 10 seconds. The filler shall be added after the bitumen and mixing shall continue after addition of the filler for at least the time recommended by the plant manufacturer or as much extra time as is necessary to obtain a homogenous mixture but for no longer.

The Aggregates and bitumen shall each be heated to enter the mixing chamber at temperatures selected within the range 150 °C to 170 °C. The temperature of the stone at entry to the mixing chamber shall not be more than 15 °C higher than that of the bitumen; the temperature of the bitumen shall be such that on entry to the mixer its Kinematic viscosity is in the range of 150-300 centistokes. The temperature of the aggregate and bitumen at entry into the mixing chamber shall be chosen within the above limits and having regard to the prevailing air temperature and haulage distance to ensure that the temperature of the mix is not less than 135°C when it is laid and not less than 120°C when rolling is commenced. If excessive displacement occurs under the roller the minimum rolling temperature may be reduced at the sole discretion of the Engineer.

The volume of the aggregates and bitumen shall not be so great as to extend above the tips of the mixer blades when the blades are in vertical position. All overheated and carbonized mixtures which form or show indication of moisture will be rejected. When moisture is detected in the finished mixture, all aggregates in the bins shall be removed and returned to the stockpiles.

1608A Transporting the Mixture

Delete the entire clause and replace it with the following

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

1609A Laying the Mixture

Add the following paragraphs:

Mixtures that have a temperature of less than 135°C when dumped into the paver will be rejected. The paver shall be adjusted and the speed regulated so that the surface of the course will be smooth and the course of such depth shall be such that, when compacted, it will conform to the cross-section shown on the drawings. Lanes shall be parallel to the road centreline.

All joints shall present the same texture, density and smoothness as other areas of the surfacing. The joints between old and new lanes or sections shall be carefully formed in such a manner as to ensure a continuous bond between the old and new pavement. All

contact surfaces at cold joints, and joints with structures including manholes and pits shall be coated with a thin and uniform coat of MC 70 or other medium curing bitumen.

1610A Compaction

Add the following paragraphs:

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

The rollers shall not be permitted to stand on surfacing which has not been fully compacted. Precautions shall be taken to prevent the dropping of oil, grease, gasoline or other foreign matter on any layer.

The Contractor shall provide competent workmen who are capable of performing all work incidentals to the correction of all surfacing irregularities.

After final rolling, no vehicular traffic of any kind shall be permitted for at least 24 hours.

1611A Finishing Joints and Edges

Add the following to this clause:

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

- (a) Joints in Binder Course relative to joints in Wearing Course: 500 mm
- (b) Joints in Dense Bitumen Macadam base relative to joints in Wearing Course: 400 mm

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

Transverse joints in Dense Bitumen Macadam Base Binder and Wearing Course shall be staggered by at least 500 mm. The roller shall pass over the unprotected end of the freshly

laid mixture only when laying of the surfacing is to be discontinued for such length of time as to permit the mixture to become cold. Otherwise 500 mm at the end of the lane shall be left uncompacted.

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

The Contractor shall adjust any kerbs, gulley pots and chambers in accordance with final finished road level before laying the final Wearing Course.

1614A Tolerances

Add the following at the end of the second paragraph:

Passing sieves between 1.0 mm and 0.075 mm sizes, +3% by total weight of dry aggregate including mineral filler

Passing 0.075 mm sieve, +2% by total weight of dry aggregate including mineral filler

1600B ASPHALT CONCRETE FOR SURFACING

1602B Materials for Asphalt Concrete

(a) Penetration grade bitumen

Delete sub-section (a) and replace with the following:

Bitumen shall be penetration grade, and shall meet the requirements of Table 4.3 in ORN 19 as summarized below:

Table 4.3 (ORN 19) Minimum requirements for penetration grade bitumen

Test, based on Original Bitumen	Test Method (ASTM)	Penetration Grade		
Penetration at 25°C	D5	40/50	60/70	80/100
Softening point (°C)	D36	49-59	46-56	42-51
Flash point (°C) (Min)	D92	232	232	219
Solubility in trichloroethylene (%) (min)	2042	99	99	99
TFOT heating for 5h at 163°C:				
(a) Loss by mass (% (Max)	D1754	0.5	0.5	0.8
(b) Penetration (% of original),(Min)	D5	58	54	50
(c) Ductility at 25°C, (Min)	D113	~	50	75

The bitumen for asphalt concrete works shall 80/100 grade.

(c) Mineral Filler

- (i) Under this sub-clause in the Standard Specification, rename Table 16B-1 as 16B-1 (a)
- (ii) Add the following

The coarse aggregate shall entirely be crushed rock from a source known to give high values of stability (>9 kN) in the Marshall Test. Crushed river gravel shall not be used. Aggregate shall be Class “a” meeting the requirements given in Table 16B-1(b) below.

Table 16B-1(b) Requirements for coarse aggregate (retained on 6.3-mm sieve)

Property	Test	Property
Cleanliness	Sand equivalent for <4.75 mm fraction (Material passing 0.425 sieve)	>40
	Plasticity index ²	<4

Property	Test	Property
	Linear shrinkage	<2
Particle shape	Flakiness index (FI) ³	<25
Strength	Aggregate Crushing value (ACV) ⁴ Aggregate impact value (AIV) ⁴ 10% FACT (dry) KN ⁴ Los Angeles Abrasion (LAA) ⁵	<25 <25 >160 <30
Abrasion	Aggregate Abrasion Value ⁴	<12
Soundness ⁷	Sodium Sulphate Soundness (SSS): Coarse aggregate Fine aggregate Magnesium Sulphate Soundness (MSS): Coarse aggregate Fine aggregate	<10 <16 <15 <20
Polishing	Polished Stone Value	>60
Water absorption	Water Absorption ⁶	<2
Bitumen affinity	Immersion Mechanical test: index of retained Marshall stability ⁸ Static immersion test ⁹ Retained indirect Tensile strength ¹⁰	>75 >95% coating retained >79% (at 75% VIM)

Key

1. AASHTO 1176

2. British standard 1377, part 2
3. British standard 812, part 105
4. British standard 812, parts 110 to 114
5. ASTM C131 and C535
6. British standard 812, part 2
7. AASHTO T104
8. D whiteoak (1990) (shell bitumen handbook)
9. AASHTO T182
10. AASHTO &283

The aggregates for bituminous mixes shall be stored in single sizes in separate bins or in areas covered with tightly laid wood planks, sheet metal, hard compact gravel, concrete or other hard and clean surfaces. The surfaces shall be self-draining, and in such a manner that will preclude the inclusion of foreign material. Aggregates of different grades and sizes and from different sources shall be stored in separate piles and if these piles are close together they shall be separated by bulkheads.

1603B Grading Requirements

The grading mixture of a coarse and fine aggregate shall be within and approximately parallel to the grading envelopes as given in table 16B-1(a) for O/20 binder coarse. In addition, the material shall comply with the requirements below.

The Contractor shall investigate a number of gradings so that a worktable mix, which also retains a minimum of 3% voids in mix (VIM) at refusal density, is identified. As guidance towards identifying a suitable grading, recommendations are provided in Tables 16B-1(c) and (d)

Table 16B-1(c): Superpave aggregate grading control point

Nominal Maximum Size (mm), (Note 1 below)	Sieve size (mm)	Control point (%passing)	
37.5	0.075	0	6
	2.36	15	41
	25.0		90
	37.5	90	100
	50	100	~
25.0	0.075	1	7
	2.36	19	45
	19.0		90
	25.0	90	100
	37.5	100	~
19.0	0.075	2	8
	2.36	23	49
	12.5	~	90
	19.0	90	100
	25.0	100	~
12.5	0.075	2	10
	2.36	28	58
	9.5	~	90
	12.5	90	100
	19.0	100	~

Table 16B-1(d): Superpave boundaries of aggregate restricted zone

Sieve size within restricted zone	Minimum and maximum boundaries of Sieve size for nominal maximum aggregate size (minimum /maximum % passing)			
	37.5	25.0	19.0	12.5
4.75	34.7-34.7	39.5-39.5	~	~
2.35	23.3-27.3	26.8-30.8	34.6-34.6	39.1-39.1
1.18	15.5-21.5	18.1-24.1	22.3-29.3	25.6-31.6
0.6	11.7-15.7	13.6-17.6	16.7-20.7	19.1-23.1
0.3	10.0-10.0	11.4-11.4	13.7-13.7	15.5-15.5

Note (1): The definition of Nominal Maximum Size of aggregate is one sieve larger than the first sieve to retain more than ten per cent of the aggregate. It is also recommended that

where possible that largest particle size should not be more than 25 mm so that the requirements of the marshal test can be complied with.

Mixes identified for compaction trials shall be manufactured to the laboratory design bitumen content and two other bitumen contents of + 0.5 % and 1.0% additional bitumen. Cores will be cut to determine the density of compacted material. The core will then be reheated to $145\pm 5^{\circ}\text{C}$ in the appropriate mould and compacted to refusal in the vibrating hammer test. The cores cut from the compaction trial must have a density equivalent to 95% refusal density.

The compaction trials will identify a workable mix which can be made to bitumen content which gives 3% voids in mix (VIM) at refusal density.

1604B Requirements for Asphalt Concrete

The nominal binder content shall be 5.0% - 5.5% in addition to the requirements given in Table 16B-2 Of the Standard Specification. The maximum Marshall stability of the mix for 2x75 blows shall be 9 kN and, at compaction to refusal, it shall have 3% voids in mix (VIM). In order to determine the suitability of a coarse aggregate source, a Marshall Test programme shall be carried out. It will be advantageous to use a crushed rock which is known from past experience to give good results in the test procedure. A grading conforming to the type I binder course detailed in Table 16B-1(a), 0/20, of the Standard Specification should be tested (but with 100% passing the 25 mm sieve) and it shall meet the requirements of Table 16B-2 of this specification.

Having established the suitability of the aggregate source several gradings shall be tested in the laboratory, including that used for the Marshall Test, to establish relationships between bitumen content and VIM at refusal density. For each mix, samples will be made up to a range of bitumen contents and compacted to refusal using a gyratory compactor and a vibratory hammer in accordance with BS 598 (Part 104:1989) with the following revision.

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

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

1605B Mixing and laying asphalt concrete

The temperature of the bitumen and aggregates when mixed shall be $110\pm 3^{\circ}\text{C}$ above the softening point (Ring and Ball) of the bitumen.

Compaction shall commence as soon as the mix can support the roller without undue displacement of material and completed before the temperature of the mix falls below 90°C .

The minimum thickness of individual layers shall be as follows:

- (a) For 37.5 mm mix 65 mm
- (b) For 25.0 mm mix 60 mm
- (c) For 19.0 mm mix 50 mm
- (d) For the 12.5 mm mix 40 mm

1606B Compaction

Rolling shall be continued until the voids measured in the completed layer are in accordance with the requirement for a minimum compacted density of 98% of Marshall Test Maximum Density or a minimum mean value of 95% of refusal density (with no value less than 93%) as appropriate.

1608B Sealing bituminous surface

After the Wearing Course has been trafficked and bitumen has hardened, the Wearing Course shall be sealed with 10/14 mm pre-coated chippings in accordance with Clause 1505C. The period of hardening will depend on the traffic level and should be such that the chippings will not become embedded in the wearing surface. The Contractor will propose and the Engineer will approve a section to be ready for sealing.

1600C DENSE BITUMEN MACADAM FOR BASE**1601C Definition**

Dense Bitumen Macadam produced from fresh materials shall comply with the “superpave” requirements given in Clauses 1602B, 1603B, 1604B, and 1605B of these Specifications.

1603C Grading Requirements for Dense Bitumen Macadam

The nominal binder content shall be as stated in the Bill of Quantities and the aggregate size shall be 0/30

1606C Compaction

Delete the entire paragraph and replace it with the following

Compaction shall be continued until voids measured in the completed layer are within the range specified in Table 16C-1 or to a mean value of 95 per cent of refusal density (with no value less than 93 per cent) as appropriate.”

1700 CONCRETE WORKS**1703 Materials for Concrete**

This work shall consist of placing selected approved material of 250 mm minimum diameter on the foundation put after excavation to receive levelling concrete in accordance with these specifications and in conformity with the lines, grades and cross sections shown on the Drawings as directed by the Engineer.

(a) Materials

Selected rock: The selected rock boulders to be placed for this work shall be hard, sound and durable quarry stones as approved by the Engineer. Samples of the stone to be used shall be submitted to and approved by the Engineer before any stone is placed.

The maximum size of the stone boulders shall be 300 mm.

(b) Construction Method

After completion of the structural excavation the surface of the loose soil shall be levelled and compacted. Then the stone of the above sizes shall be placed in one layer of 250 mm over the compacted bed where the bottom slab will rest. Coarse sand shall spread to fill up the voids in the stone boulders, and compaction with vibratory compactors should be performed to make this layer dense whereon a concrete of levelling course shall be placed.

(c) Measurement and Payment

Measurement for the bedding materials shall be made in cubic metres for the completed and accepted work, measured from the dimension shown on the Drawings, unless otherwise directed by the Engineer.

Payment for the bedding Materials for Levelling Concrete Works shall be full compensation for furnishing and placing all materials, all labour equipment, tools and all other items necessary for proper completion of the work in accordance with the Drawings and specifications and as directed by the Engineer.

Add the following for fine aggregate

It shall also meet the following requirements.

Test	Test Method	Requirement
Fineness Modulus	AASHTO M6	2.0-3.5
Sodium Sulphate Soundness loss on 5 cycles	AASHTO T104	10% Max.
Friable particles content	AASHTO T112	1% Max.
Test for organic impurities	AASHTO T21	Lighter than standard
Sand equivalent	AASHTO T17	75% Min.
Fraction passing 75 micron sieve	AASHTO T27	5% by weight max. (10% max. for crusher dust)

Add the following for course aggregate

The coarse aggregate shall conform to the following quality requirements:

Test	Test Method	Requirement
Sodium Sulphate Soundness loss on 5 cycles	AASHTO 104	12% max.
Los Angeles Abrasion	AASHTO T96	40% Max.
Content of Friable Particles	AASHTO T112	1% by weight Max.
Soft Fragments and Shale	AASHTO M80	Max. 5% by weight
Flaky Pieces	BS 812	20% Max.
Elongated pieces	BS 812	20% Max.
Combined quantity of chlorides calculated as sodium chloride and sulphates as sodium sulphate	ASTM D1411	1000 ppm, Max.

Add the following to Clause 1703(g):

The water for mixing and curing concrete shall not contain solids and impurities more than the following permissible limits:

Impurities	Permissible Limits
Organic, mg/l	200
Inorganic, mg/l	3000
Sulphates (as SO ₄), mg/l	500
Chlorides (as Cl), for plain cement concrete work and 1000 mg/l for reinforced concrete work mg/l	2000

The pH value of work shall generally be between 6 and 8.

Add the following to Clause 1703:

(iii) Limits for Total Chemical Impurities in concrete

For reinforced concrete work the total chemical impurities collected from aggregates, cement, admixtures and water shall not exceed the following limits:

Impurities	Permissible limits of undesirable chemicals in concrete in percentage by weight of cement
Chlorides (as Cl ion), (%)	0.06
Sulphates (as SO ₃), (%)	4.0

1703a Levelling of Concrete for Bottom Slab Including Formwork Cost

This work shall consist of placing and levelling lean or blinding concrete Class 15/20 over the prepared bed of stone boulders in the foundation for bottom slab and wing walls in accordance with these specifications and in conformity with the lines, grades, thickness and typical cross-sections shown on the drawings unless otherwise directed by the Engineer.

(a) Materials for levelling concrete

Requirement for the concrete class 15/20 is specified as follows:

Design compressive strength, 28 days : 15 N/mm²

Maximum size of coarse aggregate : 20 mm

Maximum cement content : 300 kg/m³

Maximum water/cement ratio of 50% with slump of 80 mm

(b) Construction Method

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

(c) Measurement and payment

Measurement for levelling concrete (Class 15/20) shall be made in cubic metres completed and accepted levelling concrete work measured in place and which has been executed in accordance with the drawings and the Specifications.

Payment for this work shall include furnishing and placing all materials, labour, equipment and tools, and other incidentals to specifications and as directed by the Engineer.

1703b Reinforcement Bars for Walls and Slabs

This work shall consist of furnishing, fabricating and placing in the concrete of the bottom slab, top slab, median wall, sidewalls, wing walls and aprons, reinforcing bars of the quality, type and size in accordance with these specifications and in conformity with the requirements shown on the Drawings.

(a) Material

Reinforcement bars shall be deformed and shall meet the requirements of British Standard BS 4461, unless otherwise called for on the drawings or approved by the Engineer.

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

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

(b) Construction Method**(i) Bar Bending Schedule**

The Engineer shall provide the Contractor with bending schedules showing the location types, sizes, bending dimensions and cut lengths of the reinforcement bars required to be fixed in the works.

(ii) Cutting and bending

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

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

Stirrups and tie bars shall be bent around a pin having a diameter not less than 15 times the minimum diameter of the bars. Bends of other bars, where full

tension in the bar may occur, shall be made around a pin having a diameter not less than 7.5 times the bar diameter as shown on the drawing.

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

(c) Placing

Reinforcing bars shall be accurately placed in proper position so that they be firmly held during placing of concrete.

Bars shall be tied at all intersections by using annealed iron wire 0.9 mm or larger diameter or suitable clips.

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

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

(d) Splicing and Joint

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

In lapped splices, the bars shall be lapped by the required length, and wired together at several points by using annealed iron wire larger than 0.9 mm.

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

(e) Joint

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

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

(f) Measurement and Payment

Bending and installation of reinforcement bars of piers and abutments shall be measured in terms of tonnes. The length of steel bar of each size will be shown on the drawings in which the bar length for splicing is excluded. In computing the weight to be measured, the theoretical weights of bars of the cross-section shown on the Drawings or authorized shall be used. These weights are given in the table below.

Bar Type and the Nominal Diameter in Millimetres	Weight of Bar in Kilograms per 12 m length of bar
Y10	7.40
Y12	10.66
Y16	18.95
Y20	29.60
Y25	46.30
Y32	75.80

1703c Formwork for Vertical Walls and Slabs

This work shall consist of all temporary moulds for forming the concrete for culvert walls and slabs together with all temporary construction required for their support. Unless otherwise directed by the Engineer all formwork shall be removed on completion of the walls and slabs.

(a) Materials

Formwork shall be made of wood or metal and shall conform to the shape, lines and dimensions shown on the Drawings.

All timber shall be free from holes, loose material, knots, cracks, splits and warps or other defects affecting the strength or appearance of the finished structure.

Release agents shall be either neat oils containing a surface activating agent, cream emulsions, or chemical agents to be approved by the Engineer.

(b) Construction Method

(i) Formworks

Formwork shall be designed to carry the maximum loads, which may be imposed and so be rigidly constructed as to prevent deformation due to load, drying and wetting, vibration and other causes. After formwork has been set in correct location it shall be inspected and approved by the Engineer before the concrete is cast.

If requested, the Contractor shall submit to the Engineer working drawings of the formwork and also calculations to certify the rigidity of the formwork.

Unless otherwise described in the Contract, all form joints for exposed surfaces of concrete shall form a regular pattern with horizontal and vertical lines continuous throughout each structure and all construction joints shall coincide with these horizontal and vertical lines. PVC pipes of 50 mm diameter for weep holes shall be arranged as shown on the Drawings.

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

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

(ii) Scaffolding

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

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

(iii) Removal of formwork

The time at which the formwork is removed shall be the Contractor's responsibility and the formwork shall not be removed until the concrete strength has reached the strength to the approval of the Engineer

(c) Measurement and Payment

No measurement shall be allowed for formwork of temporary construction joints.

Payment for the formwork shall be incidental to the pay items of particular grade of concrete for furnishing, erecting, jointing all the formwork for the concrete including furnishings and applying release agent, and construction of the required scaffolding to support the formwork all conforming to the shape, lines, grade and dimensions of the structure as shown on the Drawings, all in accordance with the Drawings and as directed by the Engineer.

1703d Concrete Works to Vertical Walls and Slabs

This work shall consist of furnishing, mixing, delivering and placing of the concrete for the construction of culvert walls and slabs in accordance with these specifications and in conformity with the requirements shown on the Drawings.

Concrete class 25/20 shall be used for Culvert walls and slabs.

(a) Concrete Materials

(i) Cement:

Cement shall be of Portland type and shall conform to the requirements of BS 12 or equivalent.

The Contractor shall select only one type or brand of cement. Changing of the type or brand of cement will not be permitted without a new mix design approved by the Engineer. All cement is subject to the Engineer's approval. However, approval of cement by the Engineer shall not relieve the Contractor of his responsibility to furnish concrete of the specified compressive strength requirements.

Conveyance of cement by jute bags shall not be permitted. Storage in the Contractor's silo or storehouse shall not exceed more than two (2) months and

age of cement after manufacture at mill shall not exceed more than four (4) months. The Contractor shall submit to the Engineer for his approval the result of quality certificate prepared by the manufacturer.

Whenever it is found out that cement has been stored too long, moist or caked, the cement shall be rejected and removed from the project.

(b) Aggregates

Fine and coarse aggregates must be clean, hard, strong and durable, and free from absorbed chemicals, clay coating or materials in amounts that could affect hydration, bonding, strength and durability of concrete.

Grading of aggregates shall conform to the requirements in the tables below.

(i) Grading of Fine Aggregate

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

(ii) Grading of Coarse Aggregates

Size Coarse Aggregate	Amounts finer than each standard sieve percentage by weight							
	40	30	25	20	15	10	5	2.5
	100	~	~	90 100	~	30 - 69	0 - 10	~

Other requirements for aggregates are as detailed below.

(iii) Fine Aggregates

Fitness Modulus, AASHTO	M – 6
Sodium Sulphate Soundness, AASHTO T104:	Max. 10% loss

Content of Friable Particles AASHTO 112:	Max 1% by weight
Sand Equivalent, AASHTO T176:	Min. 75

(iv) **Coarse Aggregate**

Abrasion, AASHTO T96	Max 405 loss
Soft Fragment and shale, AASHTO M80:	Max. 5% by weight
This and elongated Pieces, AASHTO M80:	Max. 15%

(v) **Water**

All sources of water to be used with cement shall be approved by the Engineer. Water shall be free from injurious quantities of oil, alkali, vegetation matter and salt as determined by the Engineer.

(vi) **Admixture**

Only admixture, which have been tested and approved in the site laboratory through trial mixing for design proportion shall be used.

Before selection of admixture, the Contractor shall submit to the Engineer the specific information or guarantees prepared by the admixture supplier. The Contractor shall not exclude the admixture from concrete proportions.

Chemical admixtures where permitted shall conform to the requirements of AASHTO M194. Unless otherwise specified, only Type A (Water reducing), Type B (Retarding), Type D (Water reducing and retarding), Type F (Water reducing, high range) or Type G (Water reducing, high range and retarding) shall be used.

Admixtures containing Chloride ion (Cl) in excess of one percent by weight of the admixture shall not be used in reinforced concrete.

A Certificate of Compliance signed by the manufacturer of the admixture shall be furnished to the Engineer for each shipment of the material used in the works.

(c) **Concrete class 25/20**

Concrete Class 25/20 shall be used for culvert walls and slabs. The requirements of concrete Class 25/20 are provided as follows unless otherwise the Engineer will designate any alteration.

Design compressive strength, 28 days:	25N/mm ²
Maximum size of coarse aggregates:	20 mm
Maximum water/cement ratio of 45% with slump of 80 mm	

(d) Proportioning Concrete

The Contractor shall consult with the Engineer as to mix proportions at least thirty (30) days prior to beginning the concrete work. The actual mix proportions of cement, aggregates, water and admixture shall be determined by the Contractor under supervision of the Engineer in the site laboratory.

The contractor shall prepare the design proportions which has 120% of the strength requirement specified for the designated class of concrete.

No class of concrete shall be prepared or placed until its job-mix proportions have been approved by the engineer.

(e) Concrete Work

(i) Batching

Batching shall be conducted by weight with accuracy of:

Cement	:	0.5 %
Aggregate	:	0.5 %
Water and Admixture	:	1 %

Equipment should be capable of measuring quantities within these tolerances for the smallest batch regularly used as well as for larger batches.

The accuracy of batching equipment should be checked every month in the presence of the Engineer and adjusted when necessary.

(ii) Mixing and delivery

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

(iii) Concrete in hot weather

No concrete shall be placed when the ambient air temperature is expected to exceed thirty three degrees Celsius (33°C) during casting operations.

(iv) Concreting at night

No concrete shall be mixed, placed or finished when natural light is insufficient, unless an adequate approved artificial lighting system is operated; such night work is subject to approval by the Engineer.

(v) Placing

In preparation of the placing of concrete, the interior space of formwork shall be cleaned and approved by the Engineer prior to casting concrete. All temporary members except tie bars to support formwork shall be removed entirely from the formwork and not buried in the concrete. The use of open and vertical chute shall not be permitted unless otherwise directed by the engineer.

The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is cast in the formwork.

(f) Measurement and Payment

Measurement for the Concrete Works Class 25/20 of culvert walls and slabs shall be made in cubic metres for the walls and slabs actually constructed, measured from their dimensions shown on the drawings. Payment for the Concrete Works (Class 25/20) of culvert walls and slabs shall be the full compensation for furnishings all materials of the concrete mixing, delivering, placing and curing the concrete, equipment and tools, labour and other incidentals necessary for the completion of the work in accordance with the Drawings and these specifications and as directed by the Engineer.

1704 Concrete Works of the Beams and Deck Slabs**1704.1 Description**

This work shall consist of furnishing, mixing, delivering and placing of the concrete for the construction of the in situ beams and deck slab, including form F3 type finish, in accordance with Standard Specifications and in conformity with the requirements shown on the Drawings.

Concrete Class 30/20 shall be used for beams and slabs.

1704.2 Concrete materials**(a) Cement**

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

The Contractor shall select only one type or brand of cement or others. Changing of the type of cement will not be permitted without a new mix design approved by the Engineer. All cement is subject to the Engineer's approval. However, approval of the cement by the Engineer shall not relieve the Contractor of the responsibility of furnishing concrete of the specified compressive strength requirements.

Conveyance of cement by chute bags shall not be permitted. Storage in the Contractor's silo or store house shall not exceed more than two (2) months, and the age of cement after submitting to the Engineer the result of quality certificate prepared by the manufacturer for his approval.

Whenever it is found out that cement have been stored too long, moist, or caked, the cement shall be rejected and removed from the project.

(b) Aggregates

Fine and coarse aggregates must be clean, hard, strong and durable, and free from absorbed chemicals, clay coating, or materials in amounts that could affect hydration, bonding, strength and durability of concrete. The aggregates should conform to BS 882.

Grading of aggregates shall conform to BS 812.

Other requirements for aggregates are as given below.

(i) Fine Aggregates

Fitness Modules	AASHTO M-6	2.3 to 3.1
Sodium Sulphate Soundness	AASHTO T104	Max. 10% loss
Content of Friable Particles	AASHTO 112	Max. 1% by weight
Sand Equivalent	AASHTO T176	Min.75

(ii) Coarse Aggregate

Abrasion	AASHTO T96	Max. 405 loss
Soft Fragment and Shale	AASHTO M80	Max. 5% by weight
Thin and elongated pieces	AASHTO M80	Max. 15%

(c) **Water**

All sources of water to be used with cement shall be approved by the Engineer. Water shall be free from injurious quantities of oil, alkali, and vegetable matter and salt as determined by the Engineer.

(d) **Admixture**

Only admixture which have been tested and approved in the site laboratory through trial mixing for design proportion shall be used.

Before selection of admixture, the Contractor shall submit to the Engineer the specific information or guarantees prepared by the admixture supplier.

The Contractor shall not exclude the admixture from concrete proportions.

1704.2.1 Concrete class 30/20

Concrete Class 30/20 shall be used for in situ beams and deck slabs. The requirements of concrete Class 30/20 are as detailed below unless otherwise the Engineer will designate any alteration.

Design compressive strength, 28 days: 30N/mm²
 Maximum size of coarse aggregates: 20 mm
 Minimum cement content: 300 kg/m³, and
 Maximum water/cement ratio of 45% with slump of 80 mm

1704.2.2 Proportioning Concrete

The Contractor shall consult with the Engineer as to the mix proportions at least thirty (30) days prior to beginning the concrete work. The actual mix proportions of cement, aggregates, water and admixture shall be determined by the Contractor under supervision of the Engineer in the site laboratory.

The contractor shall prepare the design proportions which has 120% of the strength requirements specified for the designated class of concrete.

No class of concrete shall be prepared or placed until its job-mix proportions have been approved by the Engineer.

1704.2.3 Concreting Work**(a) Batching**

Batching shall be conducted by weight with accuracy of

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

Equipment should be capable of measuring quantities within these tolerances for the smallest batch regularly used as well as for larger batches.

The accuracy of batching equipment should be checked every month in the presence of the Engineer and adjusted when necessary.

(b) Mixing and Delivery

Slump of mixed concrete shall be checked and approved against designated slump in these specifications. The time elapsing from when the water is added to the mix until the concrete is deposited in place at the site of the work shall not exceed thirty (30) minutes in case that the concrete is hauled in non agitative type trucks or carriers, or more than sixty (60) minutes in case that it is hauled in truck mixers or other carriers with agitators.

(c) Concrete in Hot Weather

No concrete shall be placed when the ambient air temperature is expected to exceed thirty three degrees Celsius (33°C) during casting operations.

(d) Concreting at Night

No concrete shall be mixed, placed or finished when natural light is insufficient unless an adequate approved artificial lighting system is operated, and such night work is subjected to approval by the Engineer.

(e) Placing

In preparation of the casting of concrete, the interior space of formwork shall be cleaned and approved by the Engineer prior to casting concrete. All temporary members except tie bars to support formwork shall be removed entirely from the formwork and not buried in concrete. The use of open and vertical chute shall not be permitted unless otherwise directed by the Engineer. The Contractor shall provide a sufficient number of vibrators to properly compact each concrete batch immediately after it is cast in the formwork.

1704.3 Measurement and Payment

Measurement for the Concrete Works for beams and deck slabs shall be made in cubic metres for the walls and slabs actually constructed, measured from their dimensions shown on the Drawings. Payment for the concrete works of beams and deck slabs shall be full compensation for furnishing all materials of the concrete mixing, delivering, placing and curing the concrete, equipment and tools, labour and other incidentals including form F3 type, necessary for the completion of the work in accordance with the Drawings and these specifications and as directed by the Engineer.

1705 Mixing Concrete

Add the following to Clause 1705 of the Standard Specification.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators, or other approved containers. The time elapsing from the time water is added to the mix until the concrete is deposited in place at the site of the work shall not exceed 30 minutes when the concrete is hauled in non-agitating trucks, or more than 90 minutes when hauled in truck mixers or truck agitators.

Where concrete is supplied from a central plant, there shall be sufficient transporting equipment to ensure continuous delivery at the rate required. The rate of delivery shall be such as to provide for the proper handling, casting, and finishing of the concrete. The method of delivery and handling the concrete shall be in a way which will facilitate casting with a

minimum of re-handling and without damage to the structure or the concrete. The methods of delivery and handling for each site shall be approved by the Engineer. The Engineer may suspend the mixing and casting of concrete at any site for which he considers the Contractor's delivery equipment inadequate until such a time as the Contractor provides additional approved delivery equipment.

Concrete shall be allowed to be placed only when the Engineer or his representative is present at the site and has previously checked and approved in writing the positioning, fixing and condition of the reinforcement, and the alignment and suitability of the formwork.

Concrete shall be placed so as to avoid segregation of the materials and displacement of the reinforcement. When casting involves dropping the concrete by more than 1.5 metres, it shall be conveyed through sheet metal troughs, chutes or other approved pipes. The chutes, troughs and pipes shall be kept clean and free from coating of hardened concrete by thoroughly washing with water after each operation.

Rename Clause 1740 as 1740.1 and add the following to this clause:

1740.2 Interlocking Concrete Paving Block

(a) Quality

The block for the paving works shall be as shown on the drawings and as directed by Engineer. The blocks shall be 60 mm thick of quality concrete class of such that yields the strength of 50 N/mm², having specified the size and type with grey or red or combination of them.

Grading of sand for bedding			Grading of sand for the joint filling	
Sieve Size (mm)	Percentage Passing		Sieve Size (mm)	Percentage Passing
9.52	100		2.36	100
4.75	95 – 100		1.18	90 – 100

Grading of sand for bedding			Grading of sand for the joint filling	
Sieve Size (mm)	Percentage Passing		Sieve Size (mm)	Percentage Passing
2.36	90 – 100		0.6	60 – 90
1.18	50 – 95		0.3	30 – 60
0.6	25 – 60		0.15	10 – 30

Grading of sand for bedding			Grading of sand for the joint filling	
0.3	10 – 30		0.075	0 – 10
0.15	0 – 15			
0.075	0 – 10			

(b) Foundation of Paving Blocks

Over the prepared and consolidated sub-grade a layer of Sub-base using crushed aggregate shall be laid to falls and slopes to a compacted thickness of 100 mm and compacted with C-10 tonne roller. Over the prepared sub-base, fine sand shall be laid and compacted to 25 mm in thickness and to required falls and slope to the satisfaction of the Engineer.

(c) Paving Blocks Laying

The blocks shall be laid on top of the prepared base in required pattern as directed by the Engineer. On completion of the laying work, approved fine screened sand shall be spread over the paving and the joints filled with fine sand compacted as directed by the Engineer. Extra sand on the surface shall be removed by brushing. When required, the edge blocks shall be cut clean and sharp with approved tools and as per the manufacturer's instructions. The cut edges shall be rubbed smooth before laying. Compaction with a power vibrating plate (Wacker model VPH 70) shall be used suitably as recommended by the approved proprietary manufacturer. Any blocks damaged during laying shall be replaced. The entire work of the installation and materials shall meet the approval of the Engineer.

1741 Measurement and Payment

Delete Clause 1741(c).

Add the following to Clauses 1741 (d), (e) and (f):

Read Clause 1741(l) as follows:

The precast unit of measurement shall be m³ of particular grade of concrete.

Add the following to this section:

1742 Plant and Equipment for Aggregates and Concrete**1742.1 Aggregate Processing Plant**

Aggregate processing plant to be provided by the Contractor shall conform to the following:

(a) Type of Plant

Except where aggregates are supplied from commercial sources, a modern and dependable aggregate plant capable of producing satisfactory concrete aggregates in sufficient quantities and the rate necessary to meet the requirements of the construction schedule shall be provided at a location acceptable to the Engineer. Complete facilities shall be provided for proper crushing, washing, classifying, storing, reclaiming and delivering the aggregates to the mixing plant.

(b) Samples and Test

The aggregate plant shall be operated for a sufficient time in advance of the dates set for first placement of concrete to permit the development of procedures which result in high capacity production of aggregates proven by tests to meet all the requirements of this specification.

(c) Fines in Sand

The facilitation for fine aggregate production shall be so designed and operated as to retain the necessary quantity of finer fractions. An excess of fines will not be permitted. If natural sand is from marine source, the sand shall be cleaned of clayey material and washed with potable water before use. All crushing, washing, screening, classifying, blending, batching, or other properties of fine aggregate necessary to meet these specifications shall be performed so as to produce acceptable gradation complying with this specification.

(d) Drainage of Sand

Aggregates shall not be removed directly from the washing or classifying operations to the aggregate bins in the concrete mixing plant, but shall be stored as required, to permit drainage of excess water and in such a manner as to avoid contamination by foreign materials. Sand shall remain free-draining storage for at least 48 hours prior to use.

(e) Segregation

The stockpiles for aggregates shall be formed so as to prevent segregation, and as approved by the Engineer. The deposition and removal thereof shall be conducted in a manner to maintain the uniformity of grading. The side slopes of stockpiled aggregates shall be kept flatter than the angle of repose to prevent accumulation of coarser material at the bottom of the slope.

(f) Volume of Storage

Sufficient live storage of all size fractions of processed aggregates shall be maintained at all times, to permit continuous placing of concrete at the rates so as to meet the scheduled requirements. If aggregates are stockpiled on the ground, the bottom portion of the stockpile within 300 mm of ground shall not be used. The Contractor may also plan to store sufficient quantity of coarse and fine aggregate so that concreting during the rains can proceed without hindrance as the collection of the same during the rains may be difficult.

(g) Approval of Aggregate Plant Layout

Plans and written specifications for the aggregate processing plant including description and capacity data on the processing equipment, and flow charts of the whole processing operation which shall show rates of flow of material at the various crushing and separation points in the processing, as well as the volumes of the stockpiles and the number and types of equipment to be used in transporting the aggregates from aggregate plant to the mixing plant, shall be submitted to the Engineer in advance of plant erection for his approval.

1742.2 Concrete Plant

A modern dependable batch type mixing plant capable of producing concrete of specified quality and at the rate of output required to meet the specified requirements, and a balanced complement of transporting, handling and placing equipment shall be provided at locations and in a manner approved by the Engineer. The concrete mixing plant shall be completely installed for a sufficient length of time prior to scheduled date for placement of first concrete, to enable the Engineer to make the necessary physical tests, prior to use of the plant for the production of concrete.

(a) Standby Arrangement

As a standby arrangement to the batching and mixing plant, the stationary mixer/mixers of capacity 700 litres of mixed concrete and other appropriate equipment shall be provided.

(b) Type of Plant

The type of plant to be furnished shall be fully automatic. The term “automatic” is used to define a plant in which:

- (i) Batch weights are set manually on a mix selector
- (ii) Mixes are charged automatically by mix selector
- (iii) Materials are batched automatically

Ice flaking machine of sufficient capacity shall be installed as a part of batching plant.

(c) Batchers

Individual weigh batchers shall be provided for all works, requiring the use of more than two separate size groups of coarse aggregates. Cumulative weight batchers may be used for work requiring the use of not more than two separate size groups of coarse aggregates provided that the cement is weighed and batched separately from the aggregates. The batchers shall be arranged to permit the convenient addition or removal of material. Batching equipment shall be so constructed and arranged that the sequence and time of discharge can be controlled to produce a re-blending and mixing of the aggregates and, wherever possible, mixing of the cement with the aggregates as the materials pass through the charging hopper in to the mixer. This control shall be effected by the controls of the batcher discharge gates. Batchers shall be so interlocked that a new batching cycle cannot be started until all batchers are completely empty.

(i) Weighing Units

Every delivering point of aggregates and cement into the mixer, charging hopper shall have a weighing unit and each weighing unit shall include a visible, springless direct reading dial which shall indicate the scale load at all stages of the weighing operation from zero to full capacity.

The scale dials and the weighing equipment shall be in full view of the operator, so that he may conveniently observe the operation of the batcher gates and the discharge of the materials. Provision shall be made for adjustment and change in weights of materials being charged in the hopper.

(ii) Measuring Water

Water shall be measured by weight except in situations for which written approval is given by the Engineer to measure by volume. The mechanism for

measuring and delivering water to the mixers shall not permit leakage when the valves are closed.

The filling and discharge shall be measured by weight. The filling shall be capable of ready adjustment to permit varying the quantity of the admixtures to be batched. The equipment shall be kept in a clean and fully operating condition.

(iii) Tolerance in Batching

Weighing devices shall be capable of measuring the various ingredients of the following accuracy.

<u>Materials</u>	<u>Percent (by weight)</u>
Cement	1
Water	1
Aggregate smaller than 40mm size	2
Admixture	1 (or volume)

(iv) Records & Charts

An accurate record shall be maintained at the batching plant by the Contractor for the following:

- (a) The weight of the cement, water and admixture
- (b) The weight of the aggregate for each size shall be recorded separately.
- (c) Temperature of the concrete immediately after mixing
- (d) Mixing time of each batch when all the materials are loaded into the mixer
- (e) Time when the concrete is delivered from the mixer
- (f) Ambient temperature

(v) Recorders

A recorder shall be provided for each set of units measuring each of the materials delivered to the mixer. The recorder shall produce a continuous visible record, on a single ruled chart, of the weight of the cement, water and each size of aggregates, of the mixing time of each batch after all materials are in the mixer, of the temperature of the concrete and of the time of day at intervals of not more than fifteen (15) minutes. The recorder shall be completely housed and shall be capable of being locked and shall be placed in a position convenient for observation by the plant operator and the Engineer. Each chart shall be so ruled

and printed that it may be readily and permanently identified, so that the quantities and time may be read directly without scaling or calculation. A portion of the recorder chart equivalent to at least thirty (30) minutes of plant operation shall be visible after recording. This portion of the chart shall be supported over its entire width on a smooth, firm backing so that notes can be made without puncturing the paper. The recorders and scale dials shall be housed in a room, box or compartment visible at all times and sufficiently tight to exclude objectionable dust coming from the plant operation.

1900 STRUCTURAL STEELWORK**1901 General**

The fabrication and erection of all structural steelwork shall be under the constant supervision of competent and experienced personnel. All workmanship shall be in accordance with the best modern workshop practice and only skilled workers trained and experienced in steel fabrication and erection shall be employed.

1902 Applicable Standards

The supply, fabrication and erection of structural steelwork shall be in accordance with the provisions of the relevant clauses of the following British Standards:-

BS 4	Structural steel sections
BS 4848	Hot rolled structural steel sections
BS 153	Steel girder bridges, part 1- Materials and workmanship and part 2 – Weighing, shipping and erection
BS 4360	Weldable structural steels
BS 4395	High strength friction grip bolts and associated
Parts 1&2	nuts and washers for structural engineering (metric series).
BS 4604	The use of high strength friction grip bolts in structural steelwork.
BS 2708	Unified black square and hexagon bolts, screws and nuts (UNC and UNF threads).
BS 4190	ISO metric black hexagon bolts screws and nuts.
BS 3692	I.S.O metric precision hexagon bolt screws and nuts.
BS 3692	I.S.O metric precision hexagon bolt screw and nuts
BS 4320	Metal washers for general engineering purposes.
BS 5135	Metal arc welding of carbon and manganese steels
BS 638	Arc welding plant, equipment and accessories.
BS 639	Covered electrodes for the manual metal-arc welding of mild steel and medium tensile steel.
BS 4870	Approved testing and welding procedures, part 1 Fusion welding of steel
BS 4871	Approval testing of welders working to approved welding procedures, part 1 Fusion welding of steel.

BS 5493 Protective coating of iron and steel structures against corrosion.

1903

Materials

All structural steel shall be to the Grade as defined on the Drawings and shall comply with the requirements of BS 4360 in every respect

Mill certificates shall be supplied to the Engineer in duplicate to confirm the mechanical and chemical properties.

Steel for headed stud shear connectors shall have a minimum yield stress of 385 N/mm² and a minimum tensile strength of 495N/mm².

1904

Storage of Materials

Structural steelwork whether plain or fabricated shall be stored above ground on platforms, skids or other supports and in such way as to prevent pools of water forming on the ground. It shall be kept free from dirt, grease and other deleterious material and shall be protected as far as is practicable from corrosion. The time limits for outside storage of unpainted or primed steelwork shall be as detailed in the Special Specification.

1905

Fabrication

Fabrication shall generally be in accordance with the requirements of BS 153 part 1, workmanship. Rolled material, before being processed, must be straight or flat. Straightening or flattening, where required and where permitted by the Engineer, shall be accomplished by a process not harmful to the material.

The contractor shall submit to the Engineer for his approval two sets of shop drawings with calculations as appropriate and the contractor shall not commence fabrication until written approval has been given by the Engineer. The Engineer will give comment or approval within 28days after receipt of the shop drawings and calculations. Such approval shall not relieve the contractor of any of his responsibilities under the contract.

Following approval of the shop drawings the Contractor shall supply to the Engineer a further four copies of each drawings for the use of the Engineer and the Employer.

The components of various members of the structure shall be placed in jigs of approved design and all welding shall be carried out in accordance with clause 1907. Every precaution shall be taken to prevent distortion.

1906 Preparation of Edges and Ends of Plates

Edges and ends shall be either:

- (a) Left as rolled, sawn, machine cut, machine flame cut;
- (b) hand flame cut and ground to a smooth profile; or
- (c) for stiffeners and gussets not exceeding 12mm thick, sheared and subsequently ground to a smooth profile.

Where ends of stiffeners are required to be fitted, they shall be ground to be in contact with the flanges over 80% of the area of stiffener.

After shearing or flame cutting of plates, one of the following requirements shall be satisfied:

- (a) the hardness of the cut edge shall not exceed 350HV 30 of BS 427;
- (b) the cut edge is incorporated in a weld;
- (c) the material from the edge is removed by machining or grinding to demonstrate that the hardness of the edge is less than 350HV 30 of BS 427;
- (d) the edge is softened by an approved heat treatment and is shown to be free from cracks by crack detection procedures; or
- (e) the material is Grade 43 steel and is not greater than 40mm thick and the edge preparation is by machine flame cutting.

1907 Welding

Welding will be permitted only where shown on the Drawings, and the agreed shop drawings.

All welded operations shall comply with the requirements of BS 5135

The details of all welds shall be arranged to achieve the most satisfactory welding procedure. The details of the welding procedure shall be submitted to the Engineer for his approval and no welding may commence without the prior approval of the Engineer. No departure from an approved procedure may be made without prior approval of the Engineer. Welding procedure details to be submitted to the Engineer shall include the following;-

1. Welded position.
2. Fusion face preparation
3. Pre-heating

4. Electrode make, type and size and mechanical properties
5. Number and arrangements of runs
6. Welding current
7. Arc energy
8. Method of back gouging and sealing
9. Proposed methods of quality control and testing of welds

Welding shall be carried out under the supervision of an experienced and competent supervisor in accordance with the requirements of BS 5135. The welders shall be tested in accordance with the requirements of BS 4871 prior to the commencement of the work.

The Contractor shall carry out trials of the welding procedure in accordance with the requirements of BS 4870

Welding plant and accessories shall comply with the requirements of BS 638 and shall be used in accordance with the manufacturer's instructions. The welding plant shall be capable of maintaining at the weld the current and voltage specified by the manufacturer and in accordance with the welding procedure.

The electrodes shall be selected with regard to the quality of the material to be welded and the optimum performance with the welding procedures and shall comply with the requirements of BS 639. All electrodes shall be stored in their original packets in a dry and preferably heated place adequately protected from the weather and shall be handled with care and in accordance with the manufacturer's instructions. Electrodes and fluxes that show signs of moisture, damage or deterioration shall be used.

Welds shall be subject to non-destructive examination and testing as specified in the Special Specification.

Welded fabrications and weld quality shall comply with the requirements of the American Welding Society Specification ANSI/AWS D1.1.81, Section 9, PART D

Stud shear connectors shall be subjected to the following tests:-

- (a) The fixing of studs after being welded in position shall be tested by striking the side of the head of the stud with a 2 kg hammer and shall pass such test if no part of the weld shows fracture or is dislodged thereby
- (b) Any stud selected by the Engineer shall be capable of being bent by striking the side of the head of the stud with a 6kg hammer until its head is displaced laterally a distance of approximately 0.25 times the height of the stud from its original position. The stud weld shall not show any signs of cracking or lack of fusion. Satisfactory studs shall not be bent back again.
- (c) Studs whose welds have failed the tests given in (a) and /or (b) above shall be replaced according to a procedure to be agreed with the Engineer

1908**Bolting**

- (a) Black Bolts

All mild steel bolts, washers and nuts shall be of the grade as specified on the Drawings and shall comply with the requirements of BS 4190, BS 2708 or BS 3692 as appropriate.

All holes shall be drilled or drilled small and reamed and shall be clean cut without torn or ragged edges. The holes shall be perpendicular to the member and not more than 2mm larger than the nominal diameter of the bolt.

In all cases where the full bearing area of the bolt is to be developed the bolt shall be provided with a steel washer under the nut to avoid any threaded portion of the bolt being within the parts bolted together. Tapered washers of the correct angle of taper shall be provided under all bolt heads and nuts bearing on beveled surfaces.

- (b) High Strength Friction Grip (HSFG) Bolts

HSFG bolts shall comply with the requirements of BS 4395 parts 1 and 2 and shall be used in accordance with the provisions of BS 4604 Parts 1 and 2.

HSFG bolts, nuts and washers shall be supplied cadmium plated to BS 3382 to a thickness marked with a suitable and permanent mark and the contractor shall obtain the written approval of the Engineer to the proposed marks before commencement of the work.

Each HSFG shall be supplied complete with its nut screwed on. Washers may be supplied on the bolt or separately and bolts and washers shall be packed in the manufacturers works and delivered to site in waterproof containers and stored under cover in these containers until required for use.

The method of tightening HSFG bolts shall be either the part turn method, the torque control method or with the use of load indicating washers in accordance with the following:-

HSFG bolts complying with standard	Permissible methods of tightening
BS 4604 part 1 and 2	1) Part turn for bolts M16 and above Torque control Load indicating washers
BS 4604 part 2 Higher Grade (parallel shank	1) Torque control 2) Load indicating washers

Whatever method of tightening is adopted, the contractor shall supply to the Engineer full details of the procedures to be adopted which shall be in accordance with the requirements of BS 4604, together with details of the tools and equipment he will be using at site and the tests to be carried out to determine the load/ torque/shank tension characteristics of the tools, bolts and the load indicating washers. No bolting shall commence until the Contractor has carried out sufficient site tests to confirm the load/torque/shank tension characteristics of the tools and bolts.

In the case of torque control tightening methods, calibration of the equipment shall be carried out daily before commencing bolting operations in accordance with the requirements of BS 4604.

Where load indicating washers are used they shall be of a type approved by the Engineer and used in accordance with the manufacturer's instructions. The general requirements of BS 4604 shall apply to the assembly and use of HSFG bolts with load indicating washers including check testing to confirm the minimum shank tension is being achieved.

HSFG bolts that have been slackened off after final tightening by any method shall be removed, discarded and replaced.

1909 Transportation Handling and Erection

Erection shall be in accordance with BS 153 part 2, Weighing, shipping and Erection. Structural steel shall be handled with due care at all times and in such a manner as not to cause damage to the steelwork or its protective coatings.

The Contractor shall submit to the Engineer for his approval two sets of drawings and calculations and details showing his proposed methods for transport, handling and erection of structural steelwork including all part, temporary supports and bracings required to ensure stability and safety during erection. The contractor shall erect the steelwork, removed the temporary supports and do all the work required to complete the works in accordance with the Drawings and this Specification. The work shall be carried out in such a manner as will not injure, overstress or disfigure any part of the structure or the foundations and any part injured, overstressed or disfigured shall be removed and replaced or rectified to comply with the requirements of this specification.

The steelwork shall be temporarily erected at the fabrication works and be subjected to inspection by the Engineer before being dispatched to site.

Drift pins will be allowed only for bringing together the several parts of the structure, and shall not be used in such a way as to distort the work or enlarge the bolt holes.

Bolts in site connections shall not be finally tightened until sufficient of the structure is properly plumbed, aligned and leveled and no subsequent straining into position will be allowed. Finally all bolts and connections shall be systematically checked and tightened.

1910 Surface Preparation of Steelwork

Surface preparation of steelwork shall be by blast cleaning in accordance with the requirements of BS 4232, second quality. The maximum amplitude of the blast cleaned surface shall not exceed 0.1mm.

Manual cleaning of structural steelwork including mechanical wire brushing, chipping hammers, vibratory needle guns and the like shall not be permitted except for small parts and then only with the prior written permission of the Engineer.

Surfaces shall be painted with the specified primer paint within four hours of having been blast cleaned.

As soon as the first undercoat has dried, a further stripe coat of paint shall be applied by brush to all edges, corners, crevices, exposed parts of bolts, rivet head and welds. The stripe coat should have the same specification as the undercoat but be a contrasting shade.

Painted surfaces shall be cleaned of dust immediately prior to the application of further paint. All loose paint, dirt and grit shall be removed and areas contaminated with oil and grease shall be cleaned with emulsion cleaners followed by washing and rinsing with clean fresh water and allowed to dry thoroughly before paint is applied.

In the case of painted steelwork where the interfaces of HSFG bolts are bare steel, the primer coat shall be taken between 10mm and 20mm inside the perimeter of the joint area.

Where paints are to be applied to parent surfaces before making of a joint they shall be stepped back at 30mm intervals commencing at 80mm from welded joints and 10mm from the perimeter of all other joints.

All bolted joints shall be sealed against the ingress of water. Gaps at joints shall be plugged with approved filler and the perimeter of all joints shall be sealed with subsequent coats of paint.

All joints, welds and surfaces affected by welding shall receive the same protective system as applied to the parent surfaces.

Within 14 days of a joint being made and accepted by the Engineer, the parent material, exposed parts of bolts, nuts and washers, weld and affected areas shall be prepared and painted.

1911

Painting

All paint used in the works shall be subject to the approval of the Engineer.

All paint shall be supplied from the store to the painters ready for application. Any addition of thinners must be made in the store under the supervision of the Engineer and only as permitted by the manufacturer's data sheet. All the requirements of the manufacturer's data sheet shall be strictly complied with.

Paint shall be applied to surfaces which have been prepared and cleaned in accordance with the requirements of clause 1910

The use of rollers shall not be permitted for the application of paint.

Paint shall not be applied under any of the following conditions:-

- (a) When the ambient temperature is less than 4°C.
- (b) When the relative humidity is greater than 90%
- (c) During for, rain or mist
- (d) When any moisture is present or likely to condense on the steel.

Each coat of paint shall be free from surface defects.

Successive coats of paint shall have different shades for identification.

The contractor shall ensure that the proposed application rates shall enable the specified minimum dry film thickness to be achieved. If the total dry film thickness is less than the specified minimum, an extra finishing coat or coats shall be applied until the specified dry film thickness is obtained.

1912 Paint Systems

The paint system to be used on structural steel work shall be as specified in the Special Specification.

1913 Damaged Surfaces

Any areas of paint which have been damaged following application shall be cleaned down to bare metal and the full specified painting system shall be re-applied. The new paint shall overlap the existing paint by at least 50mm all round the affected area.

Galvanised surfaces damaged shall be repaired either by the use of low melting point zinc alloy repair rods or powders made specifically for this purpose or by the use of at least two coats of a good quality zinc rich paint to BS 4652

1914 Measurement and Payment

(a) Item : Structural steelwork

Unit : tonne

Structural steelwork shall be measured by the tonne and shall be the weight calculated from the approved shop drawings excluding bolts, welds, washers and all other fixings required. No deduction shall be made in the measurement for splay cuts, notches and holes providing that the area of

each is less than 0.1 square metres. No allowances shall be made in the measurement for rolling margin or cutting to waste. The density of steel shall be taken as 7850 kilograms per cubic metre.

The rate for structural steelwork shall include for the cost of the following:-

- (i) Design, submission of orders, fabrication drawings, details, calculations and certificates.
- (ii) Provision of all structural steelwork, materials, bolts, nuts, washers, welding rods, and all other fixings; fabrication, including drilling, machining and welding; testing of welds and welders.
- (iii) Temporary erection at the fabrication works for inspection by the Engineer.
- (iv) Surface preparation, painting with specified paint system
- (v) Inspection, and submission of test reports and certificates
- (vi) Marking, handling, packing, transporting and storage.
- (vii) Erection, bolting, welding, including temporary bracings guys, and crane age.
- (viii) Complying with all the requirements of section 19 of this specification.

2000 ROAD FURNITURE**2001 Road Reserve Boundary Posts**

The Contractor shall establish a reference point on top of each boundary post.

2004 Permanent Road Signs

Rename the existing text with the heading “2004.1 Posts and Road Signs”

2004.1 Posts and Road Signs

Posts for road signs shall be vandal-proofed by the drilling of 3 mm diameter holes at 100 m centres on alternative sides.

Add the following to this clause:

2004.2 Colour and configuration

The colour, size and location of all traffic signs for the project road shall be as specified on the drawings and in the absence of any details or any missing details, the signs shall be provided as directed by the Engineer.

The sign shall be reflectorised as shown on the drawings or as directed by the Engineer. The signs shall be of retro-reflective type and made of prismatic reflected sheeting fixed over aluminium sheeting as per these specifications.

The cautionary and mandatory signs shall be fabricated through the process of screen-printing. With regard to informatory signs with inscriptions, the message shall be of cut out letters made in the transparent overlay film pasted over the base sheeting with pressure sensitive adhesive or as the base sheeting with pressure sensitive adhesive or as instructed by the manufacturers or as directed by the Engineer.

2004.3 Material

The various materials and fabrication of the traffic signs shall conform to the following requirements:

(a) Concrete

Concrete shall be of the grade shown on the Contract drawings or otherwise as directed by the Engineer.

(b) Reinforcing Steel

Reinforcing steel shall conform to the requirement of the relevant codes as directed by Engineer unless otherwise shown on drawing.

(c) Bolts, nuts, washers

High strength bolts, precision bolts and nuts shall conform to the relevant specifications. The bolts and nuts shall be galvanised (zinc coated, 0.55 kg/m² minimum single spot) and galvanising shall conform to the relevant specifications.

(d) Plates and supports

Plates and support sections for the signposts shall conform to the relevant specifications. The plates and supports shall be galvanised (zinc coated, 0.55 Kg/m². minimum single spot.) and galvanising shall conform to the relevant specifications.

(e) Aluminium

Aluminium sheets used for sign boards shall be of smooth, hard and corrosion resistant aluminium alloy conforming to the relevant specification. The back of the sheet shall be painted with two coats of Epoxy paint.

The thickness of the sheet shall be 3 mm for all types of signs.

2004.4 Structural Details

The structural details for supports shall be as per the Contract drawings and/or as directed by the Engineer.

2004.5 Retro-reflective Sheeting

(a) General Requirements

The retro-reflective sheeting used on the sign shall consist of the white or coloured sheeting having a smooth outer surface, which has the property of retro-reflective over its entire surface. It shall be unused and shall show no evidence of cracking, scaling,

pitting, blistering, edge lifting or curling and shall have negligible shrinkage or expansion. A certificate of having tested the sheeting for these properties in an unprotected outdoor exposure facing the sun for two years and its having passed these tests shall be obtained from a reputed laboratory of the manufacturer of the sheeting, for each lot separately.

The reflective sheeting shall be of prismatic lens type OF ASTM - Type-IX.

(b) Lens Type

The retro-reflective sheeting shall be of Prismatic lens type, consisting of cube corner lenses and pressure sensitive adhesive and should be applied to the sign substrate at room temperature of 18 °C, transparent, waterproof plastic having smooth surface. The coefficient of retro-reflective as determined in accordance with ASTM Standard E- 810 shall give the minimum values as indicated in table given below.

Minimum Coefficient of Retro-reflection for Retro-reflective sheeting Prismatic Lens Type (candelas/lux/m²)

Obtuse Angle (°)	Entrance Angle (°)	White	Yellow	Green	Red	Blue
0.1	-4	660	500	66	130	30
0.1	+30	370	280	37	74	17
0.2	-4	380	285	38	76	17
0.2	+30	215	162	22	43	10
0.5	-4	240	180	24	48	11
0.5	+30	135	100	14	27	6
1.0	-4	60	60	8	16	3.6
1.0	+30	45	34	4.5	9	2

When totally wet, the sheeting shall not show less than 90% of the values of retro-reflectance indicated in table above. At the end of 7 years, the sheeting shall retain at least 75% of its original retro-reflectance.

2004.6 Messages and Borders

The messages (legends, letters and numerals) and borders of Cautionary/Regulatory sign boards shall be screen printed. Screen printing shall be processed and finished with materials in a manner specified by the sheeting manufacturer and shall be bonded with the sheeting in the manner specified by the manufacturer.

The messages (legends, letters and numerals) and borders of information signs shall be of cut letters made in transparent overlay film pasted over the base sheeting with pressure sensitive adhesive or as instructed by the manufacturers or as directed by the Engineer.

For screen printed transparent coloured areas on white sheeting, the co-efficient of retro-reflection shall not be less than the values of corresponding colour in the table above.

Cut-out messages and borders, wherever used, shall be made in transparent film applied on base sheeting with pressure sensitive adhesive with the coefficient of retro-reflection which shall not be less than the values of corresponding colour in the table above. For the background colour of the sign the coefficient of retro-reflection shall not be less than that specified in the table above for the respective colours.

2004.7 Colour

The colour shall be as specified and shall conform to the requirements of the table below. Conformance to colour requirements shall be determined spectrophotometrically in accordance with ASTM E 1164, with instruments utilizing either 45/0, or 0/45 illumination/viewing conditions and tolerances as described in ASTM E 1164 for retro-reflective materials.

Conformance to Colour Requirements

								Reflectance		
								Limit (y)		
Colour	x	y	x	y	x	y	x	y	Min	Max.
White	.30	.3	.35	.35	.33	.37	.28	.32	40.0	
Yellow	.48	.42	.54	.45	.46	.53	.42	.48	24.0	45.0
Red	.69	.31	.59	.31	.56	.34	.65	.34	3	15
Blue	.07	.17	.15	.22	.21	.16	.13	.03	1.0	10.0
Green	.03	.39	.16	.36	.28	.44	.20	.79	3.0	9.0

The four pairs of chromaticity coordinates determine the acceptable colour in terms of CIE 1931 standard colorimetric system measured with standard illumination source D65. These colours are equivalent to those listed in ASTM D4956 using source C.

The colour shall be durable and uniform in acceptable hue when viewed in daylight or under normal headlights at night.

2004.8 Adhesives

The sheeting/film shall have a pressure sensitive adhesive of the aggressive tack type requiring no heat, solvent or other preparation for adhesion to a smooth clean surface. The adhesive shall be protected by an easily removable liner (removable by peeling without soaking in water or other solvent) and shall be suitable for the type material of the base plate such that it shall not be possible to remove the sheeting from the sign base in one piece by use of sharp instrument. The adhesive shall form a durable bond to smooth, corrosion and weather resistant surface of the base plate. In case of pressure sensitive adhesive sheeting, the sheeting shall be applied in accordance with the manufacturer's specifications.

2004.9 Fabrication

The surface to be reflectorised shall be effectively prepared to receive the retro-reflective sheeting. The aluminium shall be de-greased either by acid or hot alkaline etching and all scale/dust removed to obtain a smooth plain surface before the application of retro-reflective sheeting. If the surface is rough, approved surface primer may be used. After cleaning, the metal shall not be handled, except by suitable device or clean canvas gloves, between all cleaning and preparation operation and application of reflective sheeting/primer. There shall be no opportunity for the metal to come in contact with any contaminants prior to the application of retro-reflective sheeting.

Complete sheets of the material shall be used on the signs except where it is unavoidable. At splices, sheeting with pressure sensitive adhesives shall be overlapped not less than 5 mm. Where screen printing with transparent colours is proposed, only butt jointing shall be used. The material shall cover the sign surface evenly and shall be free from twists, cracks and folds. The transparent overlay film in which cut-out messages have been made shall be bonded with sheeting in the manner specified by the manufacturer.

2004.10 Warranty and Durability

The Contractor shall obtain from the manufacturer a seven year warranty for satisfactory field performance including stipulated retro-reflectance of the retro-reflective sheeting of Prismatic lens type and that of transparent film and submit the same to the Engineer. In addition, a seven year warranty for field satisfactory performance of the finished signs with retro-reflective sheeting of Prismatic lens type, inclusive of the screen printed or cut out letters/legends, transparent film and their bonding to the retro-reflective sheeting shall be obtained from the contractor/Supplier and submitted to the Engineer. The Contractor/Supplier shall also furnish a certification that the signs and materials supplied against the assigned work meets all the stipulated requirements and carry the stipulated warranty.

Warranties shall be given in original and shall have legal jurisdiction in Kenya. Warranties given by power of attorney holders will not be acceptable.

Processed and applied in accordance with recommended procedures, the reflective material shall be weather resistant and, following cleaning, shall show no appreciable discoloration, cracking, blistering or dimensional change and shall not have less than 50 % of the specified minimum reflective intensity values, given in the table under Clause 2004.4 (b) above, when subjected to accelerated weathering for 1000 hours, using type E or EH weatherometer (AASHTO Designation M-268).

2004.11 Installation

Sign posts, their foundation and sign mountings shall be so constructed as to hold these in a proper and permanent position. Sign supports shall be of galvanised structural steel and shall be firmly fixed to the ground by means of properly designed foundation or as shown on the Contract Drawings. The work of the foundation shall conform to the relevant clauses of the Standard Specification.

All components of the signs and supports, excluding the back side of aluminium sheet and the reflective portion, shall be thoroughly scaled, cleaned and galvanised (zinc coated, 0.55 Kg/m². minimum single spot.) and shall conform to the relevant specifications.

The signs shall be fixed to the posts by welding and/or bolts and washers as shown on the drawing. After the nuts have been tightened, the tails of the bolts shall be furred over with a hammer to prevent removal.

2004.12 Foundation for Support

The foundation for the supports of the sign boards with single support shall be by making excavation in all type of strata to the sizes and levels as shown on the relevant drawings and fixed with class 20/20 cement concrete during installation.

The foundation for the supports of the sign boards with two or more supports shall be made by boring holes in all types of strata to the sizes and levels as shown on the relevant drawings and fixed with class 20/20 cement concrete during installation. All concrete works shall be carried out as per the relevant specifications.

2004.13 Measurement for Payment

The measurement of standard cautionary and mandatory sign boards shall be in numbers of sign boards supplied and fixed and this shall constitute full payment for the supply of all materials for the sign board and its supports and foundations, fabrication and installation in the ground or embankment as per the specifications.

2004.14 Rate

The Contract unit rate shall be payment in full for the cost of making the road sign including supports and foundations, including all materials, installing it at the site and incidentals to complete the work in accordance with the specifications. In case of overhead sign boards supported on overhead gantry the rate shall not include the support gantry, its foundation and erection which shall be paid separately.

2005 Road Marking

Road marking paints shall be hot applied thermoplastic materials as specified under Clause 219 of the Standard Specification.

2006 Guardrails

Add the following to this clause:

2006.1 Removing, Renovating and Re-erecting Guardrails

Where the existing guardrails have to be removed, or removed and re-erected, or removed, renovated and re-erected, the three processes of removal, renovation and re-erection shall be carried out as follows:

(a) Removing the Guardrails

All guardrails and end units shall be loosened. Posts shall be carefully dug out and the holes shall be filled and compacted in 150 mm layers. Items used for fixing, including bolts, nuts, washers, shall be placed in bags, after which all materials shall be transported to a store approved by the Engineer and all stored in-groups by type.

Where material is intended for re-use, it shall first be unpacked for inspection by the Engineer. The Engineer will decide which material that shall be disposed off if, on inspection it is found unsuitable for re-use.

(b) Renovating the Guardrails

Guardrails and end pieces suitable for re-use shall be taken to the workshop for cleaning and painting. Rust and the existing paint shall be completely removed and minor indentations hammered out. The guardrails shall receive surface treatment in accordance with Clause 2006 of the Standard Specification.

Timber posts suitable for re-use shall be cleaned and treated with an approved timber preservative. Bolts nuts and washers to be re-used shall be cleaned and all dust removed, and shall then be oiled.

(c) Re-erection

The guardrails shall be erected in positions as shown and all the removed materials suitable for re-use and as much supplementary new materials as may be necessary shall be used. Re-erection shall be as specified for new guardrails.

2006.2 Pedestrian Railing

Pedestrian safety barriers shall comply with the requirement of BS 7818. The steel tubing shall be primed with zinc chromate or equal suitable for galvanizing, undercoat and finished with not less than two coats of permanent outdoor enamel of white paint.

2007 Kerbs

Name the existing text with the head as “2007.1 Installation”.

Add the following to this clause:

2007.2 Existing Kerbs

Where shown on the drawing or directed by the Engineer, the Contractor shall remove the existing road kerbs and channel, including bed and haunches. Care shall be taken to minimize over break into the existing pavement. The Contractor shall reinstate any over break with a lean concrete or such other materials as may be approved by the Engineer.

2007.3 Repair of Damaged Railing and Kerbs

The repair of damaged railing shall be done by replacement of damaged pipes and posts. The damaged kerbs shall be repaired by cement mortar.

(a) Materials as per Relevant Codes

Ordinary Portland cement

Coarse aggregate and fine aggregate

Tor steel

Water suitable for concreting

MS steel sections and pipes

Zinc rich epoxy primer like Nitrozinc primer or any approved equivalent and epoxy coal tar.

(b) Equipment

(i) Welding equipment

(ii) Painting/white washing brushes

(iii) Other miscellaneous equipment

(c) Procedure

The damaged portion of steel/RCC railing shall be removed up to the unaffected portion of the railing and the parent remaining parts which have to be connected with new components shall be thoroughly cleaned.

In case of RCC railing, the casting of new units shall be carried out by adopting standard practice of construction using all necessary care. The newly constructed RCC components shall be cured as per standard practice of curing by water. The dried up and cured concrete shall be white/colour-washed with proper care to match with the existing colours.

In case of MS pipe railing, the new components or repaired components shall be fixed with necessary care keeping in consideration the alignment and level. The railing components shall then be painted with zinc rich epoxy based primer and finishing with two coats tar epoxy or paint to match the existing colour including cleaning and surface preparations as directed by the Engineer.

The damaged kerbs shall be repaired with cement mortar and the cement mortar shall be cured as per the standard practice. The kerbs shall then be painted black and yellow in alternative bands with reflecting paint of specification and quality approved by the Engineer to give an even shade on work as per the Standard Specification.

2008 Traffic Signals

Add the following to this clause:

2008.1 Scope of Works

This section of the specification covers the traffic signal installation in accordance with specifications and bills of quantities.

The Contractor shall include for all apparatus and appliances not particularly called for in this Specification but which are necessary for the completion and satisfactory functioning of the Works. The Engineer may instruct for the installation of a traffic signal system comprising of either in part or in totality.

It is deemed that if, in the opinion of the Contractor at the time of quoting, there existed a discrepancy between the Specification and the actual work, that the Contractor clarified this difference with the Engineer before quoting.

2008.2 Specification

The work shall be executed and completed, unless expressly directed otherwise, in accordance with the following in descending order of precedence:-

- i) The specification
- ii) Traffic signal Engineering manual
- iii) The current edition of the Institution of Electrical Engineers (I.E.E) regulations
- iv) The Electric Power Act of Kenya
- v) The Kenya Power Bylaws
- vi) The British and relevant and applicable British code of practice.

Technical words, terms and expressions and abbreviations relating to traffic signals in this Contract shall have the meanings assigned to them in the above publications

2008.3 Traffic controller installation

a) Basic Requirements

Traffic Controllers should be installed in accordance with the requirements of the Ministry of Transport and infrastructure. Traffic Controllers must be Type Approved by a government or major local Authority at least in the state or country of origin.

Controllers and ancillary equipment provided must at a minimum meet the requirements of the Electro-Magnetic Compatibility standards of the state or country of origin.

All controllers must be microprocessor based and compatible with the operation of an Area Traffic Control System (ATC) and also in this regard, must be Type Approved to at least the standards of the state or country of origin. The supplier should submit Type Approval documentation stating clearly the conformity to environmental and destructive tests – wind, rain, dampness, humidity, dry-heat and vibration.

All controllers should be capable of signal display voltage dimming at 160VAC. Dimming should be operated by time-of-day schedule and should also be capable of being operated by photoelectric solar cell. The solar cell (if specified) should be carefully sited to avoid street lighting or overshadowing that could be detrimental to normal operation.

Controllers must also be capable of driving low current LED lantern displays and providing individual monitoring of all LED aspects for both correspondence and conflict checking.

b) Controller Position and Connection

Controllers should be installed within the guidelines of this document or as directed by the Engineer.

Controllers should be installed in line with the following directives:

1. To provide as useful a view as possible of the operating signal displays
2. So as not to obstruct other road users
3. In a location that is convenient and safe for parking access
4. So that a working technician is not placed in a hazardous position
5. With due respect to the location of power supplies and telecommunications
6. So as not to be in direct sunlight
7. So as not to be in an area prone to flooding
8. So as not to have undue exposure to the elements
9. So that the case door when open does not obstruct any road users
10. With regard in general to local activities, business, bus stops, taxi-ranks, etc

In the case of a Roundabout installation, the controller should not be placed on the roundabout itself. It should be placed so that as many movement displays as possible are visible from the front view.

Controllers are required to have a concrete plinth as agreed and approved by the Engineer per the specification, with power supplies and telecommunication lines separately ducted. This also applies to incoming loop feeders and traffic signal displays cables.

For road safety reasons, the concrete plinth should not be too high or placed in a position where it could be impacted by an errant vehicle.

The controller location should be agreed with the Engineer at the time of initial survey and confirmed prior to installation.

Where the controller housing is of a type intended to be pedestal/pole mounted, it should be positioned so that access to the plug-in modules is from the footpath. An integral concrete slab should be poured to enclose the poles and the pavement junction box containing the earth electrode, and the telephone line access pit.

Ground-mounted controllers should be installed on the concrete footing (plinth) referred to above. Particular care should be taken to align the 20mm internal diameter conduits for the telecommunications line into the controller, and to ensure that the housing and its frangible mounting plates are correctly positioned and installed in accordance with the controller manufacturer's installation instructions. Any variation from the manufacturer's instructions should be subject to prior agreement with the Engineer.

All cables entering the controller housing should be securely supported at their outer sheath to ensure that no mechanical strain is transmitted to the electrical connections. The individual cores should be neatly formed and tied, and positioned such that access to housing terminals is not obstructed and terminal designations are not obscured. Each cable should be individually labelled in accordance with its designation as shown on the approved cable connection chart. All cables should be clearly identified by means of approved cable markers or by means of approved, non-fading insulated tags securely tied to the cable in a readily visible position.

For all controllers, the Contractor should install an insulated draw-wire in the telecommunications conduit between the terminal box on the side of the controller housing, and the telecommunications pit.

c) Power Supply Requirements

Power Supply for the installation should be arranged by the Contractor, and should be metered, single phase with filter protection against over-current, and should incorporate earth leakage and short circuit protection. The Power Supply should be terminated in a separate fuse-box unit, located in close proximity to the controller, or in an agreed position with the Engineer. Ducting must be installed between the fuse unit and the controller as directed.

The supply compatibility of the controller and ancillary equipment should be 240VAC, 50Hz (+/- 1 percent), 30amp minimum. Actual power supply requirements are to be confirmed by the Contractor taking into account the number of heads, length of cable runs etc. It is the responsibility of the contractor to establish electrical power supply availability and conditions with KPLC.

A consumer earth terminal is to be supplied and located adjacent to the mains "cut out". The controller power supply should be able to absorb mains power interruptions of 75 milliseconds without any interference to the operation of the microelectronics or signal displays and this applies equally to dimming operation.

A minimum of two 13-amp electricity sockets (General Purpose Outlets – GPOs), comprising RCD or equivalent is to be provided within the controller case. These outlets should not be used to support any permanent equipment, and are for the use of maintenance personnel.

d) Telecommunications Connections

The Ministry of Transport and infrastructure may specify a separate, termination and test, access panel on the controller cabinet.

Ducting from the controller case to the nearest telecommunication chamber or pole must be provided for communication links, and remain separate from all other ducting.

The location of the telecommunication chamber (where applicable), should be agreed on site with the Engineer.

The termination point should consist of a firmly anchored telecommunications box containing a line isolation unit for fixed lines, or encompassing a master termination box (telephone type socket) for dial-up PSTN connections

A telecommunications circuit should be terminated within the controller utilising a standard agreed termination. A separate duct (20mm NB) should be used for telecommunications cable and this should terminate at both the controller and an agreed location usually a telecommunications company's chamber. Traffic signal controller cabinets should be required to have a separate internal conduit and telecom access chamber and flap. This chamber should be fitted with an isolation unit in the case of a point-to-point connection, or a master connection box (usually supplied by the telecommunications company), in the case of a PSTN line termination.

ISDN should usually be employed for the CCTV network. Inside the camera equipment cabinet, (which should be totally separate from the traffic signal controller cabinet), the ISDN termination boxes should be secured internally in the controller in a manner that allows any technician comfortable access for testing. Ministry of Transport and Infrastructure may request a telecommunications access chamber and test point.

PSTN, or ISDN, are to be used as agreed with the Engineer. Cellular or Radio communications may be used at some locations subject to the prior agreement of the Ministry of Transport and Infrastructure.

e) Site Operational Adjustments

The Engineer should, within 30 days of switch on, adjust the operation of the timings and timing plans.

The Contractor should allow for the incorporation of any adjustments into an updated controller EPROM. The Engineer may call on the contractor to install an updated EPROM into the controller within 5 working days of supplying the necessary information. Revised controller specification forms, and if necessary updated drawings, should also be reissued prior to installation of the new EPROM.

2008.4 Guidelines for the installation of traffic signals and associated devices

The procedures to be followed for the installation of and additions to, or replacement of, all permanent traffic signals on all purpose roads including pedestrian signals outlined are to be read in conjunction with any Departmental Advice Note or Directives from the Ministry of Transport and infrastructure on the Installation of Traffic Signals and Associated Equipment.

a) Marking out

It is the responsibility of the Contractor to mark out the position of all signal components in accordance with the plan, and the approved provisional drawings. The final positions should be agreed with the Engineer.

The position of components on design plans is indicative only. In the event of local obstructions or conflicting dimensions, the Contractor should contact the Engineer and seek a direction.

The Contractor should exercise their good judgement to ensure that no equipment is installed where it would cause an obstruction, or would be impractical to maintain or replace, or would be subject to excessive risk of damage. If necessary, a direction in this regard must be sought from the Engineer.

b) Ducting and Chambers

All installations should be fully ducted using a spinal ducting system connecting between chambers located in verges/footways (but not located in tactile paving). Poles, loops, and other equipment, should be connected to the spinal chambers in an approved manner.

Ducts in the carriageway should be installed at a depth of 750mm. Elsewhere, the depth should not be less than 450mm.

Ducts should be:

- 150mm diameter heavy duty PVC pipes
- Impact resistant and impervious to water; and
- When installed should be properly jointed or sleeved to provide a continuous smooth internal bore

A single polypropylene draw wire, securely fixed, should be left in every duct after installation of the cabling.

Spinal chambers should not be less than 600mm by 600mm by 750mm (nominal)

Chambers for loop tails should be not less than 300mm by 300mm (nominal) but loop tails may be run into spinal chambers and chambers with integral pole foundations where appropriate.

Chamber lids should be “occasional run over” type unless otherwise required by the Authority or Engineer.

c) Utility Services

Before commencing work at any site, the Contractor should make all such enquiries and inspections as may be necessary to make oneself fully conversant with the type and location of surface, underground and overhead utility services. The Contractor should, during the progress of any work at the site, take all precautions necessary to avoid damage to any such

service. In the event that the Contractor damages a service, the Contractor should be responsible for arranging repairs to be effected as soon as practicable.

The Contractor should bear the full cost of such repairs, including the cost of restoration of the surrounding area. If the Contractor is of the opinion that the proposed installation cannot be carried out owing to the location of services, the Contractor should immediately seek

direction from the Engineer in relation to any alterations that may be required for the installation.

Where necessary, the Contractor should confer and reach agreement with The Service Utilities Provider, on whose space allocation the installation would encroach, in order to ensure that the proposed underground work should not constitute an obstruction to existing services.

d) Street Furniture and Signal Heads (Lanterns)

Traffic signal heads should be incandescent or high intensity and fitted with backing boards, appropriate visors or hoods. LED aspects may be installed by agreement with the Engineer or by contract agreement. Vehicle signal aspects should be at least 200mm.

Pedestrian signal aspects should be 200mm to 300mm. The specifications for any proposed signal head for vehicles and pedestrians should be submitted at the time of bidding and must be finally agreed with the Engineer prior to installation. The visibility, light intensity and colour spectrum should be clearly stated by the contractor for the specific manufacturer, but in general should conform to, or exceed AS, BS or NF.

Poles should be installed so that the pole is not less than 1.0m from the nearest kerb face and no part of any head or traffic sign fixed to the pole should be within 500mm of the nearest kerb face. Poles should not be predrilled and should be galvanized.

Cranked or 'bent' poles may only be specified and installed by agreement with the Engineer.

Pushbutton units (PBUs) must be robust and vandal-proof, and be fitted with an indicator for a registered demand. Audible devices (with ambient noise level adjustment integral to the pushbutton units) should be used where specified, but tactile devices (integral to the PBU) may be provided and installed as agreed with the Engineer.

Poles carrying pushbutton units should be installed within 1.0m from the white line of the crossing to allow pedestrians and cyclists to easily reach the pushbuttons.

Requirements for standard items of street furniture are summarised in Table below. Requirements for other items of street furniture may be obtained from the Ministry of Transport and infrastructure. All street furniture should be designed to provide maximum operational life, maximum resistance to vandalism and minimum maintenance.

STREET FURNITURE

Type	Requirements
Poles	4.0m, 5.0m or 7.0m, pre-drilled galvanised poles. Mast-arms (galvanised) should generally be used for sites where there are two or more lanes, or as determined by the system design
Pole caps	Grey or black coloured and securely fixed to the pole.
Pushbuttons	Pushbutton units should be approved by Ministry of Transport and infrastructure, and will generally be specified in the tender documents. ELV should be used and the units should be mounted 1.1m above footpath level. The volume of the audible devices (when fitted) should be automatically adjustable in line with the ambient noise levels. Front panels should be constructed of polycarbonate or other vandal resistant material and securely fixed.
Traffic signal and pedestrian heads	Heads should be mounted so that the underside of the head should be not less than 2.0m above footpath or finished surface level and no part of the head is within 500mm of the nearest kerb face. Heads should be securely fixed so that they are not affected by wind or subject to damage by vehicles.

Secondary traffic signal heads at free standing Pedestrian Crossings should be fitted with primary hoods. Alignment should be agreed with the Engineer.

e) Vehicle Detectors

The type and location of vehicle detectors should be agreed with Ministry of Transport and infrastructure for a particular system or scheme. The detector electronic equipment is normally located in the controller housing, and loop feeder cables are run directly from the loops back to the controller.

All loops should be indelibly labelled to indicate the loop reference. Self-tuning detectors should be utilised and each channel should be marked with the loop reference.

Above ground detectors (e.g. MVD) should be of an approved type at least to the country of origin, and only installed by agreement with the Authority. They should be fixed at the top of a signal pole in a manner that will withstand movement resulting from vibration or weather conditions. All connections should be weatherproof and sealed with heat-shrink sleeves.

f) Installation of Poles and Mast-arms

Unless otherwise directed by the Engineer, no signal pole or mast-arm should be erected until all other equipment needed for the completion of the traffic signal installation is available to the Contractor, nor until the necessary channelization has advanced to a stage where all components can be installed without creating a traffic hazard.

Installation of controllers and mast-arms should be on concrete footings referred to in an approved design. Controllers, poles and mast-arms should be erected so as to be vertical. Erection of mast-arms and other special poles is subject to the supply of a concrete sample as indicated previously in this specification or as directed by the Engineer.

Due care should be taken in the assembly (where required) of the mast-arms. The tapered type mast-arm should overlap the joint-over at least 360mm. The Contractor should take all necessary precautions that the galvanising coating of the mast-arm sections is not damaged.

[NOTE: Safety clearances for mast-arms and poles in respect of overhead power lines and communications cables are the responsibility of the contractor. The Contractor should promptly notify the Engineer should it appear that these safety clearances should not be achieved in any specific instance]

g) Cabling Installation

The following guidelines apply to cabling of street signals:

- At least 3 spare cores should be provided for each LV cable run at the pole cap or pole terminal assembly.
- Joints should not be permitted for LV cabling.
- All cables should be laid in ducts and LV and ELV should be segregated into different cables as far as practicable.
- All cables (LV and ELV) should be clearly labelled at the controller and in chambers using indelible ink on plastic labels securely fixed to the cable to indicate their function in sufficient detail so as to facilitate future maintenance and modification.
- Separate neutrals should be used for signal lanterns, regulatory signs and push buttons.

- Unused cable cores at the controller should be connected to earth at the controller end only.
- Unused cable cores between poles should be connected to earth at one pole only.
- Earth connection should be in accordance with local regulations.
- Traffic signal cables should not pass through ducts or chambers used by any other service and other services should not utilize traffic signal ducts, unless explicitly agreed with the Engineer.
- If armoured cable is to be specified by the Engineer then LV (low voltage) and ELV (extra low voltage) cabling should be armoured with a steel wire stranded sheath except for detector feeder cables which should be an unarmoured single pair. The armouring should be utilized as the Earth Continuity Conductor and should have adequate conductivity for that purpose.

h) Testing Requirements

The following tests should be undertaken and copies of appropriate test certificates supplied to the Engineer on completion of the relevant tests:

- Factory Acceptance Tests (FAT) of the controller, where stipulated
- Depot acceptance tests as standard
- On site electrical tests, including earth continuity tests, in accordance with the current edition of AS, BS or NF rules, or as agreed in a proforma with the Engineer. These tests may also include an Insulation Resistance test, Polarity Test, Earth Loop Impedance test and (if fitted) ELCB, MCB and RCD tests
- Loop and loop feeder cable tests; (inductance, deflection, and circuit / insulation resistance)
- Site acceptance test (SAT) at the time of commissioning for traffic related functions

The Engineer, and others as the Engineer may consider necessary, should witness all tests. In the event of the failure of tests necessitating re-testing, incidents should be documented, and the Contractor should meet all reasonable time and travel and subsistence costs incurred by the Engineer or others attending the retest.

Commissioning and switch on should not take place until all tests are completed to the satisfaction of the Engineer, after which an Interim Completion Certificate as prescribed in the contract documents should be issued.

The Engineer may allow minor works not affecting safety to be completed after switch-on.

2008.5 Cabling and electrical connections

a) Cable Terminations

Only persons authorised to perform electrical work under the requirements of the Ministry of Transport and Infrastructure should carry out any cable termination work. For the purposes of this Specification, cable termination work should include but not be limited to:

- (1) Removal of sheathing
- (2) Stripping of conductors
- (3) Fitting of lugs
- (4) Soldering of conductors
- (5) Application of heat-shrink insulation
- (6) Securing of lugs in the terminal block
- (7) Looming and tying of cores
- (8) Electrical tests

The cables should be brought up the interior of the signal pole or mast-arm and terminated on the special terminal assembly. All cables should be firmly supported in such a manner that the weight of the cable should not impose mechanical strain on the electrical connections. Each cable should be clearly tagged with an approved type of permanent marker.

The cable sheath should be removed for an adequate length, with due precaution being taken not to damage the insulation of the individual cores. The cable cores should be neatly formed and laced to allow individual conductors to be connected to the appropriate numbered terminal. The cores of different cables at the top of a post should not be laced together in the same loom. Detector feeder cables should be sleeved to prevent water ingress.

The bunching and tying of cores should be arranged such that all terminal labelling remains visible, and individual cores may be conveniently disconnected from any terminal for subsequent maintenance. All cable cores reserved for future extra facilities (as nominated on the relevant traffic design plan) should be allocated terminals, and should be terminated.

b) Cable Installation

The following guidelines apply to cabling of street signals:

- At least 3 spare cores should be provided for each LV cable run at the pole cap or pole terminal assembly.
- Joints should not be permitted for LV cabling.
- All cables should be laid in ducts and LV and ELV should be segregated into different cables as far as practicable.
- All cables (LV and ELV) should be clearly labelled at the controller and in chambers using indelible ink on plastic labels securely fixed to the cable to indicate their function in sufficient detail so as to facilitate future maintenance and modification.
- Separate neutrals should be used for signal lanterns, regulatory signs and push buttons.
- Unused cable cores at the controller should be connected to earth at the controller end only.
- Unused cable cores between poles should be connected to earth at one pole only.
- Earth connection should be in accordance with local regulations.
- Traffic signal cables should not pass through ducts or chambers used by any other service and other services should not utilize traffic signal ducts, unless explicitly agreed with the Engineer.
- If armoured cable is to be specified by the Engineer then LV (low voltage) and ELV (extra low voltage) cabling should be armoured with a steel wire stranded sheath except for detector feeder cables which should be an unarmoured single pair. The armouring should be utilized as the Earth Continuity Conductor and should have adequate conductivity for that purpose.

c) Types of Cable

Unless otherwise agreed and specified to the Engineer, cabling should be steel wire armoured colour coded. At least 15% of cable capacity should be dedicated to spare cores for each signal display cable run and joints should not be permitted.

The cabling between the controller and signal poles should generally be in 20-core cable or should comply with the drawings for the system or individual scheme.

The Contractor should hold and retain documentary evidence to prove that the cable has been at least tested in accordance with the requirements of the country of origin.

For all 20-core cables used in LV circuits, at least three spare cores (15%) should be provided. Cabling to poles used solely for provision of pedestrian push-button facilities may be carried out using standard sheathed cable complying with AS, BS or NF, having four insulated cores of 7/0.50 gauge in addition to an earth conductor.

Cables between loop detector junction points and the associated electronic equipment (known as detector feeder cable) should be two-core screened cable complying with BS or NF. Loop cable should comply with AS, BS or NF.

Cables carrying the incoming supply should be at least 7/1.04 gauge single double-insulated or twin double-insulated 250 VAC grade cable, or such cable as may be required by KPLC, or otherwise specified in the Contract.

Before any cables are installed, the Contractor should retain and submit as requested to the Engineer documentary proof that the cable has been tested and fully meets the requirements of the Ministry of Transport and Infrastructure Specification.

At least 1m of spare cable should be coiled within the footing for each signal pole, mast-arm and controller pit and in each pavement junction box or access pit.

No more than three multi-core cables should be installed in any signal post or mast-arm.

Each cable should only have a single circuit back to the controller; i.e., ring circuits or overlapping circuits are not permitted.

All loop feeder cables should be taken back to the controller via ducts and pits; i.e., loop feeder cables should not pass through the post footings.

The Contractor should take all precautions to ensure that the cables are not damaged when these are pulled through the ducts, viz

1. Cables must be pulled by hand only, without the use of ratchets, levers, winches or other mechanical devices of any kind;
2. Whilst cables are being pulled through any duct, manual assistance should be provided to feed the cable into the duct;
3. No cable should, while being fed into a duct or being pulled out of a duct, be allowed to bear on any sharp edge of a pit or concrete footing;
4. Cables should be pulled only through one duct section at a time. For the purposes of this Specification, one duct section is the duct between two successive access points along a given cable route; and
5. Precautions should be taken to ensure that the cable is not twisted or kinked as it is being fed into the duct.

Every cable in a pit should be so positioned that it presents a minimum obstruction to other cables already installed and duct entries into the pit.

[NOTE: All rubbish, surplus cabling, off-cuts, etc, should be removed on a daily basis and the site left in a tidy condition]

d) Cable Joints

No joints should be allowed in cables laid in a duct system. For a refurbishment site where cables are directly buried, joints should be avoided as far as practicable in such cables, and no more than one joint should be made in any such cable run.

No cables should be jointed without the prior approval of the Engineer.

No joint should be made under conditions of rain or when any traces of moisture are present on the cable to be jointed. In no case should cable joints be drawn into a duct.

Except where the joint is made immediately after installation of the cable, the ends of the cable should be sealed to prevent entry of moisture into the interstices of the cable.

e) Vehicle Detector Loop Cabling

Detector loops should be installed in accordance with the drawing details of the Ministry of Transport and Infrastructure, or by agreement with the Engineer for a particular system, in the positions indicated on the relevant design plan.

Before the loop cables are jointed and before application of sealant to the saw-slots, the Contractor should carry out a wiring check.

Loop cables should be jointed to the two-core screened cables, and should run directly back to the controller housing, unless otherwise indicated in the tender documents. It is important that the joint between the two-core screened cable and the loop cables be waterproofed to prevent entry of moisture into the interstices of the two-core screened cable. A heat-shrink sleeve should be utilised in order to waterproof the joint.

Adequate precautions should be taken to prevent entry of moisture into the two-core screened cable before the joint is finally sealed. Saw-slots should be cleared of debris and moisture before installation of the loop cable. Sealant should be at least type-approved in the country of origin, and should be applied strictly in accordance with Manufacturer's instructions.

All detector loops should be wired with 7/0.50 gauge cable conforming to BS or NF.

f) Electricity Supply Cabling

The Engineer should arrange to apply for the supply of electricity for the traffic light signal installation. As soon as a reply is received from KPLC, details will be forwarded to the Contractor. Until the Contractor receives such confirmatory details, the Contractor should not commence any work on excavation for installation of supply cables. In this connection, it should be noted that the point or method of connection of the electricity supply shown on the traffic design plan is subject to confirmation, since that plan may have been drawn before the reply from KPLC is received.

The electricity supply cable must not pass through pole footing cavities. The supply cable may be installed in a common duct with signal cables under the following circumstances:

- (a) The duct has been installed by boring (under a road or driveway)
- (b) The duct was pre-existing

Where the supply cable passes through an access pit or pavement junction box, it should be sleeved with (flexible) conduit and clearly and durably labelled "DANGER: SUPPLY CABLE" in the English language.

g) Electricity Supply Connection

The electricity supply may be obtained from overhead or underground mains. In the case of an overhead supply, the Contractor should install a fuse box. The method of installation should be documented and approved by the Engineer prior to connection.

The Contractor should arrange for, and carry out all tests required by KPLC and should pay all fees connected therewith. After such tests have been completed and the installation passed, the Contractor should inform the Engineer that the supply is available.

2010 Trees

Add the following to Clause 2010 of the Standard Specification:

2010.1 Plantation of Trees and Hedges**(a) Scope**

The work shall consist of:

- Planting of tree saplings in median or other designated locations, and

- Planting of hedges within median area.

(b) Materials

(i) Dump Manure

Dump manure shall be of well decayed (at least six months) organic or vegetable matter, obtained in the dry state from the municipal dump or other similar sources approved by the Engineer. The manure shall be free from earth, stone, brickbats or other extraneous matter.

(ii) Farmyard Manure

Farmyard Manure shall be well decayed (should be at least 6 months covered in dump), free from grits and any other unwanted materials.

(iii) Good Earth

The soil shall be agricultural soil of sandy-loam texture, free from grit, murrum, shingle, stone, brickbats, building rubbish and any other foreign matter. The earth shall be free from clods or lumps of sizes bigger than 75 mm in any direction. It shall have PH value ranging between 6 and 8.5.

(iv) Oil Cake (Neem/Castor/Groundnut)

The cake shall be free from bush, dust, grit and any other foreign matter.

(v) Sapling of Trees

The sapling of trees shall be of medium height, leafy type and draught resistant variety native to the area and be of good quality of minimum of 2 m height or calliper diameter of 25 mm as directed by the Engineer.

(vi) Sapling of Hedges

The saplings shall be of draught resistant variety normally grown for hedges in the area, approved by the Engineer.

(c) Construction Operations

(i) Tree Planting and Refilling Earth after Mixing with Oil Cake, Manure and Watering

Holes of circular shape of 900 mm diameter and 1000 mm in depth in ordinary soil shall be excavated and the excavated soil, broken to clods of sizes not exceeding 75 mm in any direction, shall be stacked outside the hole. Stones, brickbats, unsuitable earth and other rubbish, all roots, weeds and other undesirable growth encountered during excavation shall be separated out and unserviceable material removed from the site as directed by the Engineer.

Useful material, if any, shall be stacked properly and separately. Good earth in quantities required to replace such discarded stuff shall be brought and stacked at site by the Contractor, with a depth not more than 500 mm from ground level. The pit shall be treated for termite by raking the soil up to 50 mm and treated with 5% Aldrin or Chloradang dust in soil.

The tree hole shall be manured with powdered neem/castor oil cake along with farm yard manure/dump manure screened through 16 mm sieve and these shall be uniformly mixed with the excavated top soil after the manure has been broken down to powder (size of particles not to exceed 6 mm in any direction) in equal proportion. A 2 m high sapling of trees shall be placed at the centre of the hole and then the mixture shall be filled into the hole up to the level of adjoining ground and then profusely watered to enable the soil to subside. The refilled soil shall then be dressed evenly with its surface about 50 mm to 75 mm below the adjoining ground level or as directed by the Engineer.

The planting shall be completed soon after completion of the median.

(ii) Circular Mild Steel Tree Guard with Bars

The tree guard shall be 900 mm in diameter.

The tree guards shall be formed of:

- 3 № 25 mm x 25 mm x 3 mm angle iron verticals 1.95 m long excluding splayed outward at lower end up to an extent of 50 mm
- 3 № 25 mm x 5 mm MS flat rings fixed as per the design

- 5 № 1.55 m long 6 mm diameter bars. Each ring shall be in two parts in the ratio of 1:2 and their ends shall be turned in radically for a length of 40 mm at which they are bolted together with 8 mm diameter and 30 mm long MS bolts and nuts.

The vertical iron shall be welded to rings along the circumference with electric plant. 15 № bars shall be welded to rings at equal spacing along the circumferences of ring. The lower end of the angle iron verticals shall be splayed outwards up to an extent of 50 mm. The lower end of the flat of lower ring shall be at the height of 1.95 m. The middle ring shall be in the centre of top and lower ring. The bars shall be welded to the rings as directed by the Engineer. The entire tree guard shall be given two coats of paint of approved brand and of required shade over a priming coat of ready mixed primer of approved brand. The design of the tree guard shall be approved by the Engineer.

(iii) Planting of Hedges

The hedges saplings shall be planted in two rows, one each along each edge of the median. Bed for the saplings shall be prepared with necessary manuring, and the live saplings shall be planted in lines parallel to the median edge to the directions of the Engineer. Spacing between saplings in a row shall be such that a thick hedge can be grown, and this shall generally be not farther away than 300 mm.

The planting shall be completed soon after completion of the medians.

(iv) Grassing of Median Area

The area of the median between the hedges shall be seeded and mulched to develop grass cover as directed by Engineer.

(d) Maintenance

The saplings of trees and hedges planted shall be watered and maintained by the Contractor till issuance of the final certificate at the end of the Defects Liability Period. This shall also include watering, weeding out of undesirable plants and replacement of dead plant, manuring and trimming of the hedges.

Add the following clauses to this section:

2012 Service Ducts beneath Roads

Where instructed by the Engineer, the Contractor shall construct service ducts beneath the carriageway and shoulders/footpaths. The ducts shall consist of 100 mm to 300 mm diameter ogee precast concrete pipes surrounded by a minimum of 100 mm thickness of Class 15/20 concrete. The minimum clearance between the road formation and the top of the concrete surround shall be 100 mm.

The ducts shall be provided with draw cords fabricated from strong man-made fibre such as nylon and each duct shall be sealed at each end with a tight fitting plastic plug. In the existing pavement, the duct shall be at least 250 mm below the road surface measured from the top of the concrete pipes and all back filling shall be in Class 15/20 concrete. The concrete pipes shall conform to the requirements of Clause 215 of the Standard Specification.

2013 Duct Markers

Duct markers shall be installed by the Contractor at each end of the services ducts provided under Clause 2012 above. The duct marker shall be located immediately beyond the outer edge of the shoulder or footpath and as close to the line of the duct as physical constraints permit. Where several ducts are laid side by side, only one duct marker post will be necessary. The duct marker posts shall be constructed as shown on the drawings and shall be clearly and durably marked on the side facing away from the road. The marker shall be inscribed 'X DUCTS' where X is the number of ducts stated in the group marked by the marker posts.

2014 Road hump and Rumble Strips

Where shown on the Drawings or instructed by the Engineer, the Contractor shall provide, place trim to line and level bumps and/or rumble strips on the carriage way, connecting roads or shoulders. Where instructed, the road bumps shall extend the full width of carriageway and shoulders. The bumps shall be constructed in asphalt concrete to the dimensions shown on the Drawings and to the same standard as the wearing course on the main carriageway.

2015 Bollards

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

2016 Retro-Reflective Road Studs

All retro-reflective road studs shall comply with BS 873: Part 4. The Contractor shall submit details of the reflective road studs he proposes to use in the works to the Engineer for approval. The Contractor shall submit also a Certificate of approval from an approving authority. The

reflective road studs shall be installed in the locations shown on the drawings or instructed by the Engineer.

2017 Measurement and Payment

(a) Item: Remove existing guardrail

Unit: m

Removal of guardrail shall be measured by the metre as the length of guardrail instructed to be removed, measured between terminal points of the sections removed. The rate shall include for loading, transporting to any point on the site, off-loading and stacking the material and disposing off material unsuitable for re-use.

(b) Item: Renovate and re-erect guardrails

Unit: m

The unit of measurement shall be the length of single guardrail, whether straight or bent, or end pieces renovated as specified. The rate shall include for all works as specified and storage as required. The rate shall also include for erecting the guardrails in accordance with Clause 2006 and any new poles, nuts, bolts and accessories that may be required.

(c) Item: Pedestrian railing

Unit: m

Pedestrian railing shall be paid by the length instructed by the Engineer. The rate shall include for supplying and erection in accordance with the drawings. It shall also include for any bending of end pieces as may be required, disposal of excess materials and tidying up the site after completion of installation.

(d) Item: Service ducts

Unit: m

Service ducts shall be measured by the metre as the length of duct installed as per the Engineer's instructions. The rate shall include for providing all materials, excavation, and installation of concrete pipes with concrete surround, backfilling to formation level, compaction, draw-cords and plugs, all in accordance with Clause 2012 above.

(e) **Item:** **Duct markers**

Unit: **Nº**

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

(f) **Item:** **Bollards**

Unit: **Nº**

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

(g) **Item:** **Reflective road studs**

Unit: **Nº**

Retro-reflective road studs shall be measured by the number installed. The rate shall include for provision and installation of studs to the manufacturer's recommendations and satisfaction of the Engineer.

(h) **Item:** **Road Bumps**

Unit: **m of each type**

2100 MISCELLANEOUS BRIDGE WORKS

2101 Waterproofing to Structures

Add the following to Clause 2101 of the Standard Specification:

For part of the structure in contact with earth, apply one coat of primer before applying two coats of waterproofing material.

The primer shall conform to AASHTO M121-79 (1993). Waterproof cement shall be of proven quality and from a reputed supplier to be approved by the Engineer.

2102 Bridge Bearings

Add the following to Clause 2102 of the Standard Specification:

All necessary tests, methods of installation, and performance guarantee shall be as specified in BS 5400, Part 9.2.

The bearings to be installed by the Contractor may either be supplied directly to the Engineer by the manufacturer or the Contractor is to supply and install the bearings as a part of the Contract. In the former case, the manufacturer shall be associated with the installation of the bearings to the full satisfaction of the Engineer, whereas in the latter case, the Contractor shall be solely responsible for the satisfactory supply and installation of the bearings.

Unit of measurement for Steel Roller and Rocker Bearing, POT and PTFE bearings shall be the number of each type (loads and movement). Unit of measurement for elastomeric bearings shall be in no.

2107 Weepholes

Add the following to Clause 2107 of the Standard Specification:

100 mm diameter PVC pipe of approved quality shall be used for weep holes.

Add the following clauses to this section:

2109 Methodology for Widening of Existing Bridges

Widening of the existing bridges shall be carried out only on one side. This shall be on the side of the existing bridge away from the proposed new bridge. Foundation and substructure for various components of the widening portion shall be cast against such components of the existing portion. Cut water of the existing piers, wherever present, shall be carefully dismantled without disturbing any other parts of the piers. For widening of the superstructure portion, the existing railing and kerbs towards the side to be widened shall be dismantled. The portion of the deck slab near the region shall be chipped off to expose the slab reinforcement. The existing kerb reinforcement shall be cut and bent so that they are well accommodated within the deck slab and no portion of the reinforcement shall remain exposed after the area is filled with concrete. The deck slab reinforcement of the widening portion shall be lapped with the exposed top reinforcement of the existing deck slab. The chipped of portion of the existing deck shall be filled up with new concrete along with concreting of superstructure of the widening portion.

Before pouring of concrete against the face of the existing structure, the same shall be kept wet with water so as to control absorption of slurry of fresh concrete by the existing structure.

All joints between the existing and new structure shall be properly treated as per the specification and as shown and directed by the Engineer.

While excavating earth close to the existing bridge or chipping/demolishing any of its parts, extreme care shall be taken by the Contractor so that no other part of the existing structure is disturbed or affected due to such breaking works and the existing structure remains safe and sound.

2110 Methodology for Repair and Widening of Existing Bridges

Repair and widening of the existing bridge at a particular site shall be taken up by the Contractor only after the new bridge at that particular site is constructed and the same can be used by the traffic. Before taking up the works of repair and widening of the existing bridge, the Contractor shall make all arrangement to ensure that both way traffic can use the new bridge and a smooth flow of traffic is maintained. The Contractor shall take all precautions to guard against any accident of traffic due to such diversion and shall use all the necessary road signs for the purpose. After completion of repair and widening of the existing bridge, temporary works carried out for such diversions shall be made good by the Contractor and all arrangements shall be made so that both the old and the new bridges at the site can be used by the traffic.

The Contractor shall prepare a detailed programme of works related to repair and widening of the existing bridges including traffic diversion activities showing dates of commencement and completion of various activities. Such programme of works shall also indicate the status of works for the new bridges.

Repair works for substructure, foundation and abutment which will not affect or disturb the flow of traffic over the existing bridges may be allowed by the Engineer to be taken up before completion of the new bridge. Written approval of the Engineer in this regard shall be obtained.

The Contractor shall get the traffic diversion scheme required for widening of the existing bridge approved by the Engineer and by other concerned authorities/statutory bodies before taking up such works at the site. The Contractor should also put up a scheme for diverting the existing services, if any, supported on the bridge under the widening scope of works.

The Engineer or his authorised representative shall reserve the right to stop any repair or widening or parts thereof if, in his opinion, such works disturb the flow of traffic. No repair or widening works on the existing bridge deck level shall be allowed before the traffic is diverted over the new bridge.

The repair and widening works shall be carried out strictly as per the detailed drawings, specification and as directed by the Engineer. If in the opinion of the Engineer, any such work is not up to the desired standard, the Contractor shall promptly make good such works to the satisfaction of the Engineer or his authorised representative. While carrying out such works, care shall be taken by the Contractor not to damage or disturb any part of the bridge, its approaches or any associated existing works. In case any part of the existing bridge or associated structures is damaged, the Contractor shall promptly repair the same as per the direction of the Engineer or his authorised representative to the satisfaction of the Engineer.

The Contractor shall remove the debris after dismantling works from the site as per the direction of the Engineer or his authorised representative.

After completion of the repair and widening work, the Contractor shall clean the existing structures and the newly widened portion and shall make it good in such a manner that it is traffic-worthy.

2111 Repair of Cracks

Repair of cracks of width more than 0.2 mm shall be carried out by injecting epoxy or cementitious grout in relatively sound concrete.

2111.1 Materials

Epoxy resin like SIKADUR 53 of M/S Sika Qualcrete or Resicrete 21 of M/S Structural Water Proofing Co. India or any other epoxy resin of M/S FOSROC or any other approved equivalent shall be used for repair to PSC/RCC Bridge. Epoxy resins shall generally conform to the manufacturers' specifications. Only such resins having a low shrinkage coefficient, high adhesion strength, water impermeability, high abrasion resistance and good bonding characteristics even in presence of moisture shall be used. Phenolics, polysters and acrylics do not generally satisfy well the above mentioned requirements and shall not be used.

The proposed epoxy resin system shall conform to ASTM C-881-87 and shall conform to the requirements stated in the table below.

Density	1.11 kg/litre
Viscosity at 30°C	500 ± 50 centipoise
Potlife at 30°C	30 minutes minimum
Compressive strength under water (for 14 days) of a 5 cm cube	90-100 N/mm ²
Bond strength (14 days)	Concrete failure

Approx. Injection pressure	2 kg/cm ²
Shrinkage	Conforming to ASTM C 883

2111.2 Equipment

Injection equipment which should possess the following characteristics is to be used:

- Ease of handling, simple function
- Low failure rate
- Cater for varying viscosity and pot life suited for the job
- Capable of injecting into cracks of width ≥ 0.2 mm
- Simple cleaning and maintenance routines
- Provision of an arrangement for controlling and stopping the injection before the gun is withdrawn
- Fitted with pressure gauge to indicate grouting pressure

Materials, equipment and procedure for injection for cementitious grout shall be the same as for polymer modified cementitious (PMC)/grout as indicated in the specification for improving concrete quality.

2111.3 Procedure

(a) Surface Preparation

The visible cracks and other outlet points nearby shall have to be sealed by adopting the given procedure. First of all, the area shall be cleaned thoroughly and all visible outlets shall be sealed. For sealing the cracks, V-notch (20 mm wide x 10 mm deep) shall be cut along the cracks. This shall be cleaned off all loose particles and dust by compressed air. A layer of epoxy bounding agent/PMC slurry shall be applied over the freshly cut surface. Epoxy repair mortar shall be used to fill the groove while the slurry coating is still wet but after a lapse of 30 minutes of the slurry coat. Entry ports for pressure injection shall then be made by pneumatic percussion/rotary drills. In each hole a plastic grouting nipple shall be fixed using epoxy mortar/PMC mortar. The spacing of the ports shall be about 300 mm c/c or be suitable for the site condition. The first and last entry ports should be established at or near the top and bottom respectively of all vertical cracks or at the ends of any horizontal crack.

The spacing of injection points shall be such as to help in maximum resin or cementitious grout material penetration and easy filling of cracks with low operating pressure.

The mixing of various components of epoxy system shall be carried out by mechanical means to ensure thorough and uniform mixing.

The injection shall be carried out from the lower most elevation to the highest elevation to ensure that air or moisture is completely displaced from the cracks and grout materials fills the cracks completely. This is indicated by the flow of grout material noticed at the higher elevation. The rate of grout material injection shall be adjusted so as to fill up all the voids. All inlet points shall be closed by suitable means to ensure that there is no flow back of grout material after the injection has been completed. In case there is no flow from other nipple, the injection should be stopped after it has attained a steady pressure of 2 kg/cm² for about 5 to 10 minutes.

2112 Repair of Honeycombs and Spallings

The repair of spalled and honeycombed concrete shall be carried out by low permeability polymer modified cementitious repair mortar.

2112.1 Materials

High early strength Portland cement conforming to IS 8112 shall be used for production of polymer modified cement repair mortar and polymer modified cementitious slurry, which is to be used as a bonding medium with concrete substrate.

The polymer latex which is to be used should consist of water based acrylic polymer and copolymer dispersion and special purpose chemicals. The polymer solid contents shall be 29 to 31 percent. The particles shall be nearly spherical shape with a diameter of 0.30 to 0.40 micrometre. The manufacturer shall certify to the above requirements about solid content and grain size. In order to keep control over the quality, the manufacturer shall provide infrared absorption spectrum analysis for the materials (polymer latex) to be supplied by him. The same material shall also be used for various purposes such as in a slurry form with cement to form a bonding or priming medium, with sand and cement in proportions recommended by manufacturer to form the repair mortar.

No additional water shall be used to prepare the PMC slurry or repair mortar as the water present in the latex is sufficient for cement hydration. The cement/latex ratio shall remain constant for various uses. The sand to be used for constituting the PMC repair mortar shall be silica sand.

The grading of the sand shall be within the limits given in the table below:

BS Sieve Size (mm)	Percentage Passing by weight
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	Coarse	Fine	Combined
10	100	100	100
4.75	95-100	100	98-100
2.36	90-100	100	80-100
1.18	40-60	100	70-80
0.6	0-19	90-100	45-55
0.3	0-4	40-60	20-30
0.15	0-3	0-10	0-5
0.075	3 max	0-3	3 max

2112.2 Repairing Procedure

(a) Preparation of Concrete substrata

All defective areas shall be delineated and marked out on site in conformity with the supervising Engineer's directions.

Concrete on the damaged, loose or honeycombed areas shall be chipped out up to the reinforcement level or up to the level of good parent concrete or up to the point on the reinforcement where the reinforcement is free from corrosion. The chipping of concrete shall continue to expose the full circumference of the steel and to a further depth of 10 mm as directed by the supervising Engineer.

The chipped surface of concrete shall be thoroughly cleaned by wire brush and compressed air to remove all dust and loose materials.

The exposed reinforcement shall be mechanically cleaned of all rust and mill scale.

(b) Priming of Concrete Surface and Reinforcement

Before commencing the application of concrete repair mortar, the prepared concrete substrate shall be thoroughly soaked with water and the free surface water shall be removed before priming.

The well mixed polymer cement slurry (Polymer to cement ratio of 1:2) shall be applied over the well soaked but surface dry concrete and steel bar for adhesion of fresh cement and sand mortar as per the specification and as directed by the Engineer.

(c) Cementitious Repair Mortar

The repair mortar of 1 cement to 3 smooth silica sand shall be applied on the polymer cement slurry in layers of a maximum of 10 mm thickness each and up to a total thickness of 8 mm to 10 mm short of outer surface. The outer surface shall be scarified for good bonding with the next layer.

The polymer modified cement sand mortar in the proportion of 1 polymer to 2 cement to 6 sand shall be applied over the scarified cement sand mortar in maximum of 10 mm thickness and finishing smooth up to the existing surface of concrete as per the specification and as directed by the Engineer.

Curing of the repaired areas with PMC mortar shall be carried out in accordance with the acceptable good practice. However, no curing compound or curing membrane shall be used and curing shall only be carried out by spraying of water or by using wet Hessian cloth.

2113 Repair of Corroded Reinforcement

Repair of corroded reinforcement, where corrosion has reduced the diameter of the bar by more than 20%, shall be carried out by providing new reinforcement which is either welded or firmly secured with the old reinforcement.

2113.1 Material

Steel which is to be used as additional reinforcement, where the diameter of the existing main longitudinal reinforcement has been reduced to 80% of the original reinforcement, should satisfy the requirements of BS or KS. However, the BRC fabric or weld mesh which is to replace/strengthen the corroded stirrups or tie bars should be from reputed manufacturers.

2113.2 Repairing Procedure

The exposed reinforcement showing signs of deterioration by corrosion shall be cleaned by grit blasting.

When corrosion products have been removed, the diameter of the reinforcement shall be measured. If the diameter of the reinforcement is found to be reduced to 80% of the original reinforcement, then the additional reinforcement of equivalent diameter free from rust shall be firmly secured with the old reinforcement, preferably by welding, if the existing reinforcement can be welded or with a lap of at least 40 times the diameter of the bar.

2114 Expansion Joints

2114.1 Description

This work shall consist of fabrication and placing of expansion joints as indicated on the drawing and conforming to these specifications or as directed by the Engineer.

2114.2 General

The expansion joints shall be designed and duly approved by the Engineer. They shall cater for the expected movement and rotation of the structure at the joints and provide smooth riding surface. They shall also be easy for inspection, maintenance and replacement.

Expansion joints shall be robust, durable, watertight and replaceable. Site fabricated expansion joints shall be prohibited. Expansion joints shall be obtained by the Engineer either directly or through the Contractor from approved manufacturers and be of proven type.

For bridges with pre-stressed concrete superstructure with individual span length more than 20 m or built with innovative design/construction elastomeric expansion joints of slab seal or strip seal type shall be provided.

For slab type of bridges of spans less than 10 m continuous surfacing may be provided across the expansion gaps, supported on a 20 mm thick plate placed and fixed at the level of the deck slab.

For bridges other than those mentioned above with spans above 10 m, an alternative specification of sliding steel plate joint or filled joints with copper plates may also be adopted if approved by the Engineer, apart from elastomeric expansion joint of slab seal or strip seal type.

Vehicular traffic shall not be allowed over expansion joints after its construction for such period as may be determined by the Engineer.

Proprietary type deck joints offered by the Contractor in lieu of the type specified shall comply in all respects with the manufacturer's specifications and meet the required range of movements and rotations and be fit for the purpose of ensuring satisfactory long term performance in the bridge.

Where alternative type proprietary deck joints are proposed by the Contractor, the following information shall be provided:

Name and location of the proposed manufacturer

Dimensions and general details of the joint including material specifications, holding down bolt or anchorage details and installation procedures

Evidence of satisfactory performance under similar environmental conditions of similar joints being produced by the manufacturer

Any acceptance of alternative types will be at the sole discretion of the Engineer.

Such deck joints shall be installed in accordance with the manufacturer's recommendations and to the general requirements of this Specification.

No expansion joint shall be provided only for the width of the carriageway. It shall follow the profile including the kerb and the footway and fascia, if provided. The type of expansion joint for the latter may be made different from that used for the carriageway expansion joint.

2114.3 Requirements

(a) Criterion

The requirement criterion will be separately applicable for the expansion joint proper and the transition zone of attachment to the deck.

(b) Types of Performance

There are two types of performance requirements for the expansion joint proper namely from the necessity of the bridge and from the road users such as man, animal and vehicle.

(c) Performance Requirement with Respect to Bridges

The expansion joint shall:

- Withstand the imposed load including the impact load from live load and other sources
- Allow expansion and contraction movement due to temperature, creep, shrinkage, prestressing and structural deformations
- Permit relative rotation in elevation and plan due to the causes as noted above,
- Be waterproof

Bridge deck expansion joint seals play a critical role in preventing the degradation of the structural components of the bridge system. Without effective joint seals, water passes through the bridge deck and works harmfully to corrode steel components and cause deterioration of the concrete. Rainwater gathers various corroding additives from the atmosphere and also from the carriageway.

- Ensure sealing

In case bridge deck joints are not sealed, apart from loss of waterproofing, grit and other forms of road debris may enter the joint. Debris, when impacted with the joint can seriously restrict the movement instead of facilitating the same. In the case of proprietary joints being accepted for adoption, the sealing shall be as directed by the Engineer.

- Ensure long life by being resistant to corrosion
- Be easy to install
- Be easy to maintain
- Be easy to replace
Replaceability of expansion joint shall be one of the basic criteria for selection of the type of expansion joint.
- Be resistant to the materials likely to collect/spill over the deck in its normal service.

(d) Performance Requirement with Respect to User

The expansion joint shall:

- Provide smooth continuity at the top of the deck for riding comfort
- Be of skid resistant surface
- Re- non-damaging to the rubber tyre
- Make minimum noise during vehicular crossing

- Ensure that animal paws and hooves should not get entangled where bridges are used by animal drawn traffic
- Permit passing of bullock cart steel tyre for bridges where bullock carts ply, and
- Look good aesthetically.

(e) Performance Requirement for Transition Zone

This is the zone of connection of joint assembly and the adjoining deck.

The expansion joint shall:

- Permit transfer of generated forces without distress without getting uprooted. The purpose will not be served if the bonding is with the wearing coat only. Anchorage must be provided with the deck structural element.
- Ensure that surface in the transition zone stays undisturbed during long term service.

2114.4 Steel Plate Sliding Expansion Joints

In this type of buried joint, the wearing coat shall be made continuous over the joint. The other alternative shall be to keep a gap in the wearing coat which is filled up with a seal and filler, to be provided in extremely hot areas.

Materials for steel plates shall conform to Section 1900 of the Standard Specification. The exposed metallic components shall be galvanised or coated with approved anti-corrosive paint. The thickness shall be 20 mm or so for obtaining satisfactory performance.

Plates shall be placed to the line, grade and expansion gap shown on the drawings with any adjustment required for temperature. Particular care shall be taken with the top of the plates.

Plates shall be firmly held in place during concreting by methods approved by the Engineer.

Any temporary bolts or other fixings, which prevent relative movement of the adjacent parts of the joint, shall be removed as soon as the concrete has set sufficiently to hold the expansion plates in their correct positions. In any case, temporary bolts or other fittings shall be removed within 6 hours of placing concrete unless otherwise directed by the Engineer.

Care shall be taken to prevent damage to expansion joint plates or its coating. If any damage occurs, the plates and coatings shall be restored by the Contractor to the satisfaction of the Engineer. Plates shall be free of oil, rust, loose paint or other similar material before coating.

2114.5 Filler Joints

The components of this type of joint shall be at least 2 mm thick corrugated plate placed slightly below the wearing coat, 20 mm thick compressible board, to protect the edges. Twenty (20) mm thick pre-moulded joint filler shall fill the gap up to the top level of the wearing coat sealed with a joint sealing compound.

The material used for filling expansion joint shall be bitumen impregnated felt, elastomer or any other suitable material, as specified on the drawings. Impregnated felt shall conform to the requirements of IS: 1838, and shall be approved by the Engineer. The joint filler shall consist of large pieces and assembly of small pieces to make up the required size shall be avoided.

Expansion joint materials shall be handled with care and stored under cover by the Contractor to prevent damage. Any damage occurring after delivery shall be made good to the satisfaction of the Engineer and at the expense of the Contractor.

Joint gaps shall be constructed as shown on the drawings. Surfaces of joint grooves shall be thoroughly cleaned with a wire brush to remove all loose materials, dirt and debris, then washed or jetted out.

Pre-moulded expansion joint filler shall not be placed in position until immediately prior to the placing of the abutting material. If the two adjacent surfaces of the joint cannot be placed at different times, this type of joint filler shall not be placed until the second face is about to be placed.

Sealants shall be installed in accordance with the manufacturer's recommendations and all appropriate requirements for joint face priming.

Sealants shall be finished approximately 3 mm below the upper surfaces of the joint

Joint materials spilt or splashed onto finished surfaces of the bridge during joint filling operations shall be removed and the surfaces made good to the Engineer's approval.

No joint shall be sealed until inspected by the Engineer and approval is given to proceed with the work.

2114.6 Elastomeric Slab Seal Expansion Joint**(a) Materials**

Steel inserts shall conform to IS 226. Use of any other materials like fibre-glass or similar material shall not be permitted.

Elastomer for elastomeric slab unit (ESU) shall be compounded to give hardness IRHD 60 ± 5 subject to the following additional stipulations:

- Chloroprene (CR) only shall be used in the manufacture of elastomeric expansion joints. No reclaimed/natural rubber or vulcanised wastes shall be used.
- The chloroprene material used in the manufacture of elastomeric (expansion joints) shall be Neoprene WRT, Bayprene 110, Skyprene B5 or Denka S-40V. Chloroprene content of the compound shall not be lower than 60% by weight. The ash content shall not exceed 5 per cent (as per tests conducted in accordance with ASTM D-297).
- EPDM and other similar candidate elastomers for expansion joints shall not be permitted.
- Elastomeric plugs and spacer bars shall be marked with centre-to-centre distance of fixing holes.
- Fixing bolts and nuts shall be made of stainless steel.
- Anchor bars comprising hooked anchor stiffeners shall be welded with lower steel inserts and sinusoidal anchor bars shall be welded with horizontal leg of the edge steel inserts. The elaborate anchoring arrangements of steel inserts shall be permanently welded/tied with the steel reinforcement.

(b) Fabrication

Steel inserts shall be grit blasted and provided with epoxy paint.

Edges of reinforcing steel sections shall be rounded.

Expansion joints shall be fully moulded to the required size in one single vulcanising operation including the encasing layers as integral and homogeneous part.

Tolerances of fabrication shall be as follows:

- (i) Plan dimension not less than ± 5 mm
- (ii) Total height not less than ± 3 mm

(c) Supply and Handling

The Contractor shall supply all steel-reinforced elastomeric expansion joints including bolts, nuts, sealant, plugs and all other accessories for the effective installation of the joints including angled jointing sections for kerbs.

Expansion joint material shall be handled with care and stored under cover by the Contractor to prevent damage. Any damage occurring after delivery shall be made good at the expense of the Contractor to the satisfaction of the Engineer.

(d) Installation

- (i) Expansion joints

Expansion joints shall be installed as per the approved drawing. Steel inserts, Spacer bars, concreting of pockets, fixing of elastomer slab unit and presetting, shall be carried out as per the following:

Steel Inserts

Deck casting shall be carried out leaving pockets or recess for steel inserts and anchors of the expansion joint as per the drawings.

Steel inserts shall be lowered at the appropriate location inside the pocket.

The top of the hum shall be flush with the finished level of wearing course maintaining the camber.

Spacer bars, duly set appropriately to the month of installation, shall be fitted under strict supervision.

Anchor rods shall be tied/welded with the existing deck main reinforcement maintaining level and alignment.

Welding between anchor rods mid deck reinforcement is preferable. If welding is not possible, strong steel tie wires shall be used for fastening, under strict supervision.

Spacer Bar

Spacer bar shall be used to ensure proper positioning of bolts and also levelling of the steel inserts during fixing of the same with the deck reinforcement and casting second stage concreting in the pocket thereafter.

The second stage concreting operation shall preferably be started within 24 hours of fixing the steel inserts. In such cases, spacer bars should be removed just after concreting is finished. If there is a substantial time lag between fixing of inserts and concreting, then any one of the following methods shall be adopted, depending on the support condition.

For simply supported bridge resting on simple elastomeric bearings, (with no dowel pins), insert shall be placed in position with spacer bars at every alienate joints. Such joints shall be called restrained joints. In other words, inserts shall not be fixed simultaneously at two ends of one span. If the above condition is satisfied, inserts with spacer bars shall be kept in position for a substantially longer period at such restrained joints. Spacer bars shall be removed after concreting of such restrained joints and inserts placed in position with spacer bars at the other unrestrained joints thereafter.

For bridges resting on other than elastomeric bearings (including bearings with dowel pins at one end), after placing and aligning the inserts and securing the same, the spacer bars shall be removed. Concreting shall be carried out with great care so that inserts are not dislocated or distorted.

While removing the spacer bar after concreting, one must take care to see that the concrete is not damaged during withdrawal of spacer bar. If the spacer bar happens to be snugly and fixed, it shall not be pulled by any means; it shall be gas cut in two pieces and then removed.

Concreting of Pocket

Concreting of pocket shall be done with great care using proper mix conforming to grade similar to that of the deck casting besides ensuring efficient bonding between deck and steel insert. Also proper care shall be taken for ensuring efficient bonding with the already cast concrete.

Needle vibrators shall be used. Care shall be taken so that the position of steel insert is not disturbed during vibration.

Spacer bar shall be removed within an appropriate time before the joint is required to permit movement.

Fixing of Elastomeric Slab Unit (ESU)

Special jig shall be used to preset the ESU during installation.

ESU (mounted on the jig, if preset) shall be lowered to position.

The line and level on the ESU should be adjusted.

ESU shall be removed and mid coated with special adhesive.

ESU shall be placed in position again, ensuring waterproof joining at the required faces.

ESU shall be tightened with stainless steel nuts and lock washers in position. Tightened nuts shall be locked with lock washers.

Special sealant shall be poured inside the plug holes.

The elastomeric plugs shall be pressed in position after applying adhesive on the appropriate surface.

ESU shall be fixed in position after completion of wearing course. While completing this part of the wearing course, adequate care shall be taken to ensure that a waterproof is joining with the already existing wearing course.

Pre-Setting

The main purpose of presetting of the steel inserts at the time of its installation is to ensure as closely as possible the condition that in the run at the mean average annual temperature, the ESU remains at its nominal state.

Major factors responsible for changing the longitudinal length of the bridge superstructure are indicated below.

- Temperature variation from annual mean.
- Changes due to shrinkage of concrete.
- Changes due to elastic shortening and creep of the prestressed bridge superstructure.
- Deformation of superstructure and substructure, if any.
- Resultant changes in expansion gap due to first factor can occur in both directions from any, pre- selected mean position whereas changes due to creep and shrinkage are unidirectional such that the expansion gap continuously increases with passage of time.
- The steel insert unit of expansion joint can be fixed in any month of the year. As stated earlier, the expansion gap between the bridge superstructure may vary from time to time; hence the initial fixing distance between fixing points will obviously depend on the month of installation of steel insert. The centre to centre distance between stainless steel fixing of bolts as indicated in the drawing can be taken as only nominal. Presetting depending on this shall modify the same.

- The difference between the mean temperature of the month of fixing of steel insert and the annual average temperature.
- The elapsed period between the casting and/or prestressing and fixing of steel insert for calculating the remnant creep and shrinkage.

(ii) Special requirements for installation

Prior to construction of bridge deck area adjacent to the joint the supplier shall provide detailed working drawings showing the location of all bolts, recesses and holes necessary for the installation of the joint.

Reinforcing bars in superstructure shall be amended as required to ensure that there will be no interference in the installation of the joint.

All bearing surfaces and recesses which are in contact with the joint assembly shall be checked with a straight edge to ensure flatness of profile.

No holes shall be drilled for fixing bolts within 7 days of concreting. Holes for the bolts shall be drilled to the size and depth shown on the drawings.

Sections of the jointing making the completed joint shall follow a straight line.

The fixing bolts shall not be placed in a position until at least 4 weeks after stressing is completed in post-tensioned box or beam and slab structures. Prior to placing sections of jointing, contact surfaces shall be cleaned to remove all grease, tar, paint, oil, mud or any other foreign material that may affect adhesion of the sealant.

Sealant shall only be applied to dry contact surfaces. Sufficient sealant shall be applied to the contact surfaces to cause extrusion of sealant when the jointing is fixed in position.

Final sealing of the finished expansion joint shall be completed immediately after completion of installation. All exposed ends, joints between units and other areas of possible leakage shall be filled with sealant. All voids between the sides of the jointing and concrete or plates shall be filled with sealant.

Bolt cavities shall be cleaned and plugged with neoprene cavity plugs. Prior to placing the plugs sufficient sealant shall be placed in the cavities to cause extrusion of the sealant by the plugs.

All excess sealant shall be removed from the jointing and adjacent arm.

(e) Acceptance Test

(i) Quality Control

The necessary quality control certification by the manufacturer in regard to properties of Elastomer and steel shall be furnished.

For severe environment, ozone resistance test shall be carried out for elastomer.

(ii) Fabricated Expansion Joint

The fabricated expansion joint shall be subjected to the following acceptance tests:

- Routine test: each expansion joint shall be tested for at least 100 cycles for a test movement, which shall be two percent more than the design expansion/contraction movement
- In addition to routine test, one out of every 20-expansion joints shall be subjected to the test movement for 4000 cycles.

The lot shall be rejected if the elastomer material shows signs of fatigue or permanent set or distress in the test. The test piece shall not be used in the bridge.

- The type of test for abrasion resistance shall be carried out for one joint out of every 20 Nos as per the BS and the standard deviation shall be within ± 20 %

It should be noted that the manufacturer shall preferably have in-house testing facility. Otherwise, the testing shall be carried out by him at his expense at any testing establishment selected by the Engineer. A manufacturer who cannot carry out the acceptance test shall not be entitled to supply elastomeric slab seal joint.

2114.7 Strip Seal Expansion Joint

(a) Components

Strip seal expansion joint shall comprise the following items:

(i) Edge bums

This special claw leg profiled member shall be of extruded rolled steel section combining good weldability with notch toughness.

(ii) Strip seal

This shall be of chloroprene with high tear strength, insensitive to oil, gasoline, and ozone. It shall have high resistance to aging. This components, provided to ensure water tightness, shall have bulbous shape of the pan of the seat which is inserted into the groove provided in the edge beam. The seal should be vulcanised in single operation for minimum full length of joint.

(iii) Rigid Anchorage

This shall be welded to the edge beam at staggered distances.

(iv) Anchor loops

This shall be made of weldable steel connecting the rigid anchorage with deck reinforcement.

(b) Material

The steel shall conform to steel grade RST 37-2 of German Standard or equivalent.

(i) Strip Seal Element Specification

Sealing element is made of chloroprene and must be an extruded section. The working movement range of the sealing element shall be at least 80 mm with a maximum of 100 min at right angles to the joint and ± 40 mm parallel to the joint.

<u>PROPERTY</u>	<u>SPECIFIED VALUE</u>
Hardness	63 ± 5 Shore A
Tensile Strength	Min 11 MPa
Elongation at fracture	Min 350 %
Tear Propagation Strength	
Longitudinal	Min 10 N/mm
Transverse	Min 10 N/mm
Shock Elasticity	Min 25 %
Abrasion	Min 225 mm ³

<u>PROPERTY</u>	<u>SPECIFIED VALUE</u>
Residual Compressive Strain	Max 28 %
(22 h\70 C/360 per cent strain)	
Ageing in hot air (14 days/70 deg C)	
Change in hardness	Max+5 Shore A
Change in tensile strength	Max -20 %
Change in elongation at fracture	Max -20 %
Ageing in ozone (24 h/50pphm/25 deg C/20 per cent strain)	No Cracks
Swelling behaviour in Oil (116 h/25 per cent C)	
ASTM Oil №	
Volume Change	Max 5 %
Change in hardness	Max 10 Shore A
ASTM Oil № 3	
Volume Change	Max 25 %
Change in hardness	Max 20 Shore A
Cold Hardening Point	Min -35 °C

(c) Fabrication (Pre- installation)

Rolled steel profiles for edge beams shall be long enough to cater for a 2-lane carriageway. These shall be cut to size of actual requirements by means of a metre box saw. Alignment of the cut-to-size steel profiles shall then be made in accordance with

the actual bridge cross-section on worktables. For this purpose, the contour of bridge cross-section shall be sketched onto these tables. After the steel profiles are aligned, they will be chucked to the tables by means of screw clamps and tacked by arc welding.

Anchor plates shall be cut to the required size by gas cutting. These shall be welded to the edge beams.

Anchor loops shall be bent to the required shape and welded to anchor plates.

The finally assembled joints shall then be clamped and transported to the work site.

(d) Handling and Storage

For transportation and storage, auxiliary brackets shall be provided to hold the joint assembly together.

The manufacturer shall supply either directly to the Engineer or to the Bridge Contractor all the materials of strip seal joints including sealants and all other accessories for the effective installation of the/jointing.

Expansion joint material shall be handled with care. It shall be stored under cover on suitable lumber padding by the Contractor to prevent damage. Any damage occurring after delivery shall be made good at the Contractor's expense to the satisfaction of the Engineer.

(e) Installation

(i) Gap Width

The width of the gap to cater for movement due to thermal effect, prestress, shrinkage and creep, superstructure deformations (if any) and substructure deformations (if any) shall be determined and intimated to the manufacturer. Depending upon the temperature at which the joint is likely to be installed, the gap dimension shall be preset.

(ii) Movement of Joint

Taking the width of gap for movement of the joint into account, the dimensions of the recess in the decking shall be established in accordance with the drawings or design data of the manufacturer. The surfaces of the recess shall be thoroughly cleaned and all dirt and debris removed. The exposed reinforcement shall be suitably adjusted to permit unobstructed lowering of the joint into the recess.

(iii) Recess

The recess shall be shuttered in such a way that dimensions in the joint drawing are maintained. The formwork shall be tight.

(iv) Joint Placing

Immediately prior to placing the joint, the presetting shall be inspected. Should the actual temperature of the structure be different from the temperature provided for presetting, correction of the presetting shall be done. After adjustment, the brackets shall be tightened again.

(v) Joint Lowering

The joint shall be lowered in a pre-determined position. Following placement of the joint in the prepared recess, the joint shall be levelled and finally aligned and the anchor loops on one side of the joint welded to the exposed reinforcement bars of the structure. Upon completion, the same procedure shall be followed for the other side of the joint. With the expansion joint finally held at both sides, the auxiliary brackets shall be released, allowing the joint to take up the movement of the structure.

(vi) Concrete Quality

High quality concrete shall then be filled into the recess. The packing concrete must feature low shrinkage and have the same strength as that of the superstructure, but in any case, not less than concrete Class 35. Good compaction and careful curing of concrete is particularly important. After the concrete has cured, the movable installation brackets still in place shall be removed.

(vii) Strip Seal

Rolled up neoprene strip seal shall be cut into the required length and inserted between the edge beams by using a crow bar pushing the bulb of the seal into the steel grooves of the edge beams. A landing to a bead shall be formed in the thickened end of the edges of the seal which would force the thickened end against the steel beam due to wedge effect when the strip seal is buttoned in place.

(viii) Seal Protection

As soon as the concrete in the recess has become initially set, a sturdy ramp shall be placed over the joint to protect the exposed steel beams and neoprene seals from site traffic. Expansion joint shall not be exposed to traffic loading before the carriageway surfacing is placed.

(ix) Carriageway Surfacing

The carriageway surfacing shall be finished flush with the top of the steel sections. The actual junction of the surfacing/wearing coat with the steel edge section shall be formed by a wedge shaped joint with a sealing compound. The horizontal leg of the edge beam shall be cleaned beforehand. It is particularly important to ensure thorough and careful compaction of the surfacing in order to prevent any premature depression forming in it.

(f) Acceptance Test

All steel elements shall be finished with corrosion protection system.

For neoprene seal, the acceptance test shall conform to the stipulated requirements. It shall also be stretch tested. If a manufacturer is to supply this type of joint he will have to produce a test certificate accordingly conducted in a recognized laboratory in Kenya or abroad.

In view of the importance of the built up edge beams, special investigation of fatigue strength of this section with anchorages to withstand 2×10^6 load change cycles without showing signs of damage, will be required. The supplier shall have to produce a test certificate in this regard conducted in a recognised laboratory in Kenya or abroad.

The manufacturer shall produce test certificates indicating that anchorage system had been tested in a recognized laboratory to determine optimum configuration of anchorage assembly under dynamic loading.

The manufacturer shall satisfy the Engineer that water tightness test for the type of joint has been carried out in a recognized laboratory to check the water tightness under a water pressure of 4 bars.

As strip seal type of joint is specialised in nature, generally of the proprietary type, the manufacturer shall be required to produce evidence of satisfactory performance of this type of joint.

(g) Tests and Standards of Acceptance

The materials shall be tested in accordance with these specifications and shall meet the prescribed criteria.

The work shall conform to these specifications and shall meet the prescribed standards of acceptance.

(h) Measurements for Payment

The expansion joint shall be measured in running metres. For filled joints, the rate per running metre shall include the cost of sealant for the depth provided in this drawing.

(i) Rate

The contract unit rate shall include the cost of all material, labour, equipment and other incidental charges for fixing the joints complete in all respects as per these specifications in the case of the Contractor supplying the expansion joint. If the manufacturer supplies the expansion joint directly to the Engineer, the cost of installation, handling and fixing shall be borne by the Contractor.

2115 Repair of Expansion Joints

The expansion joints shall be repaired by cleaning the muck filled up in the expansion joints and for preventing any further filling up of the joints and subsequent non-functioning of the joints. The joints shall be improvised as shown on the drawings.

2115.1 Materials

- (a) Structural steel conforming to BS Codes
- (b) Fe 415 HYSD bars conforming to BS Codes
- (c) Compressible fibre board
- (d) Polysulphide Sealant
- (e) Ordinary Portland Cement conforming to KS 1825
- (f) Aggregates conforming to BS
- (g) Water conforming to the specifications in BS
- (h) Epoxy bonding agent like FOSROC's Nitobond EP or any approved equivalent.

The epoxy bonding agent shall conform to ASTM C-881-89 or equivalent and shall also conform to the following requirements:

- | | | |
|----------------------------|---|-----------------------------|
| (i) Density | ~ | 1.3 kg/litre, approximately |
| (ii) Pot life | ~ | at least 45 minutes at 30°C |
| (iii) Compressive strength | ~ | 50 N/mm ² |
| (iv) Flexural strength | ~ | 30 N/mm ² |
| (v) Tensile strength | ~ | 25 N/mm ² |

2115.2 Equipment

- Welding Equipment
- Vibrators
- Concrete mixing machines
- Other general tools used in construction.

2115.3 Procedure for Repair

The bituminous wearing course and RCC/PCC wearing course near the expansion joints shall be removed by jack hammer or any suitable means as shown on the drawings and the muck shall be disposed off as directed by the Engineer.

The expansion joint and the adjoining structural concrete shall be cleaned of all dust, muck and any deleterious material. For removing the muck from the expansion joint, water jet may be applied from both top and bottom.

The structural steel shall be cut and welded as shown on the drawings and to the profile of the road cross section. The structural steel shall be painted for rust protection.

2116 Fixing Dowel Bars in Concrete

2116.1 Scope

The work shall consist of fixing HYSD bars in the existing concrete deck slab/other concrete components to facilitate bonding of a structural component with an existing one.

At least 14 days before start of the work, the Contractor shall furnish detailed methodology of construction including sources of supply of material, tools, equipment and appliances to be used on work, details of personnel and supervision.

The Contractor's personnel shall be qualified and experienced in repair and rehabilitation work of such nature.

2116.2 Materials

HYSD bars shall conform to BS.

The grout material used for fixing HYSD bars in drilled holes in concrete shall be obtained from a reputed manufacturer and grout mix shall be prepared in conformity with the manufacturer's recommendations. The material shall be either of the following:

- (a) Two/three component low viscosity epoxy resin system, having required characteristics of bonding with concrete and resistances to moisture penetration (Resicrete 21 or Resicrete 212 of M/S Structural Waterproofing Co. or SIKADUR BTP of M/S Sika Qualcrete or equivalent).
- (b) Cement grout in powder form consisting of cement, good quality sand and admixtures when mixed with required amount of water forms a pourable mix to be used for bonding HYSD bars in concrete (EXCEM – E1 manufactured by M/S Structural Water Proofing Company or M/S SIKADUR or equivalent).

The epoxy resin system shall conform to BS.

The cement grout shall basically be shrinkage compensated, chloride free and of very high strength (50 MPa at 28 days). The mix should be capable of pumping or pouring and shall have excellent bond strength with concrete and steel (bond strength of 15 MPa with HYSD bars at 28 days).

2116.3 Construction Operations

The construction operation shall be in the following sequence, and shall be supervised by the Contractor's key personnel well experienced in such works:

- (i) Drill holes of required diameter and depth at desired locations as shown on the drawings.
- (ii) Clean the hole with air blast through air nozzle of 6-mm dia. connected to air compressor to remove the drilled powder, which may remain inside the drilled hole.
- (iii) Mix the required quantity of grout so that the work could be completed within the normal setting time as specified by the manufacturers.
- (iv) Pour required quantity of mixed grout in the holes.
- (v) Insert the dowel rod in the hole where grout has been placed. Move the rod up and down several times to drive out entrapped air, if any.
- (vi) Allow the curing time as per manufacturers specifications.
- (vii) Inclined dowels shall be straightened to match their intended profile only after the grout has finally set and required strength has been achieved.

2116.4 Measurement for Payment

Measurement for fixing HYSD bars in concrete involving drilling in concrete and fixing HYSD bar with suitable fixing agent shall be measured in number of such HYSD bars fixed in position.

2116.5 Rate

The Contract unit rate for fixing of HYSD bars in the existing concrete slab/other components shall include cost of all material, labour, tools and plants, drilling required diameter hole in concrete, placing in position, temporary works, testing and curing and other incidental expenses for the satisfactory completion of the work as per the specifications.

Add the following clauses:

2200 DAY WORKS**2201 Scope**

This specification covers instructions that may be issued by the Engineer as additional or substituted work to be executed on a day work basis by the Contractor or by his sub-contractors.

2202 Standards

All codes and standards mean the latest. Where not specified otherwise the installation shall generally follow the Kenyan Standard Specification for Road and Bridge Construction

2203 Measurement and Payments

Measurement and payment for all day works items shall be in accordance with the items listed in the Bill of Quantities, the preamble to Bill of quantities and the specifications above and cover the payment of plant, labour and materials for work executed in accordance with the Engineer's instructions.

SECTION 23 – CONCRETE PAVING BLOCKS AND SLABS**2301 GENERAL**

This works shall consist of providing, laying and fixing of concrete paving blocks and concrete paving slabs on a sand base on the driveway and walkways and other areas as directed by the Engineer.

2302 INTERLOCKING CONCRETE PAVING BLOCKS

The interlocking precast concrete paving blocks shall be of quad (rectangular) shape fitting within a 295 mm square coordinating space and the following work size thicknesses:-

- (i) 80mm Heavy Duty type of nominal strength 45N/mm² for roadways and bus stops
- (ii) 60mm Light Duty type of nominal strength 35N/mm² for footpaths and cycle tracks.

The blocks shall be grey in colour unless otherwise directed by the Engineer.

The blocks shall conform to the requirements of Kenya Standard KS02-827.

Precast concrete paving blocks must be delivered to site in the manufacturer's original unopened, undamaged containers packaging with identification labels intact and in steel banded or plastic wrapped packaging capable of transfer by fork lift or clamp lift.

Materials shall be stored and protected such that they are kept free from mud, dirt and other foreign materials, as per manufacturer's instructions.

The blocks shall be laid in a herringbone pattern, and the laying shall be broken at intervals of 50 m by concrete ribs of class 25/20 concrete.

The precast concrete paving blocks shall not be installed during heavy rain or on saturated sand. Precast concrete paving block units shall be placed either mechanically or by hand, on the prepared laying course in the nominated pattern. String lines will be used to check alignment of paving blocks. Joint (bond) lines shall not deviate more than +/- 15mm in 15m. The order of laying which maintains an open face should be used. After final compaction the surface course must conform to the surface tolerance levels.

Cutting and Trimming: Cut blocks should be incorporated at the perimeter of the pavement, at intermediate restraints and around obstacles. Sizes smaller than one quarter of the original plan size should be avoided. Blocks should be trimmed to fit after laying full paving blocks.

Temporary restraints must be provided to prevent paving units moving during construction or for areas that cannot be completed for some time.

Edge restraints shall be provided around the complete area of blocks by class 25/20 concrete cast in-situ. Edge restraints may alternatively be formed by existing structures, kerbs, channels, blocks set on concrete, etc. Edge restraints shall be capable of preventing the loss of bedding sand and the sideways movement of blocks, and of supporting anticipated traffic loads.

The blocks shall be laid on a 50 mm minimum sand bedding layer so as to achieve a uniform 40mm compacted depth after vibrating.

A plate compactor with minimum plate area of 0.25 m² capable of 75kN per unit area of plate at a frequency of 65 – 100 Hz shall be used to bed the blocks into the laying course by making at least two passes. Prior to compaction all debris must be removed from the surface. Compaction should not occur within 2m of unrestrained edges of paving units.

The Contractor shall proceed with the laying of bedding sand and interlocking concrete paving blocks only after the sub-grade, sub-base and base pavement layers together with all drainage provisions are approved and accepted by the Engineer. Drainage inlets shall be protected with filter fabrics to prevent ingress of laying course material.

Tolerances of surface level and surface regularity: The maximum permissible deviations from the design level of the different layers are:

Laying course (bedding sand)	40mm thickness:	-5mm, +10mm
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Surface course:		+ 6mm
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The bedding sand must not be used as a levelling course to fill voids in the base surface as this will lead to subsequent settlement. Before commencement of the block laying, the preceding work i.e. base construction and edge restraints shall be checked to ensure they are in compliance with the tolerances stated above. Particular attention shall be paid to the levels and tolerances to ensure that when the block layer is completed the sand laying course nowhere exceeds 50mm in thickness.

The absolute maximum thickness of bedding sand layer shall be 50mm. Where this thickness is exceeded the Contractor will scarify, add material, shape and re-compact the base layer at his own expense to ensure compliance.

Where blocks are laid abutting drainage channel and outlets for pedestrian areas or fittings, the surface of the blocks shall be between 3mm and 6mm above the channel or fitting. Where

blocks are laid abutting gullies or drainage fittings, the surface of the blocks shall be between 5mm and 10mm above the gully grating and frame.

2303 CONCRETE PAVING SLABS

Precast paving slabs shall be of class 25/20 concrete with A193 wire mesh reinforcement. They shall be 600 mm x 600 mm dimension in plan and 50 mm thickness. The slabs shall be laid on walkways and other areas as directed by the Engineer. These areas shall have been compacted to 95% MDD (AASHTO T99).

The slabs shall be laid on a 50 mm minimum sand bedding layer.

2304 SAND FOR BEDDING AND JOINTING

Sand used as bedding for paving blocks and slabs shall be natural river sand. The grading shall conform and be parallel as much as possible to KS02 – 95 Parts 1 & 2: 1984 for zones 1, 2 or 3. The other requirements shall be as specified in section 1703(c) of standard specifications. The coarse aggregate shall be entirely crushed rock dust from a source which is known to give high crushing strength values of ACV <20.

The bedding sand materials shall comply with the grading requirements specified below.

Sieve size (mm)	Percentage by mass passing (%)
8	100
6.3	95 - 100
4	85 - 99
0.5	30 - 70
0.063	0 - 1.5

The jointing sand shall be natural river sand, clean, hard, non-plastic and free from deleterious matter and silt, symmetrically shaped. Stone dust, mason dust and limestone screenings shall not be used.

The jointing material (sand) shall conform to the grading requirements as specified below:

Sieve size (mm)	Percentage by mass passing (%)
2	100
1	85 - 99
0.5	55 - 100
0.063	0 - 2

2305 MEASUREMENT AND PAYMENT

Payment for paving blocks and paving slabs shall be by square metre laid. The rate quoted should include the cost of haulage to site of the blocks, slabs including concrete ribs and sand bedding,

(a) Item: Interlocking precast concrete block paving

Unit: m²

Interlocking block paving shall be measured by the square meter of the finished pavement area.

The rate shall include for provision of all materials, including precast concrete paving blocks, bedding sand, concrete ribs and concrete edge restraint, cutting & shaping of concrete blocks around the periphery of the pavement area, as necessary, to comply with the construction drawings.

The rate shall also include for laying and vibrating in place and all measures required to produce the finished paved areas within the tolerances specified.

(b) Item: Precast concrete paving slabs

Unit: m²

Paving slabs shall be measured by the square meter of the finished pavement area.

The rate shall include for provision of all materials, including precast concrete paving slabs, bedding sand, cutting & shaping of concrete blocks around the periphery of the pavement area as necessary, and jointing, to comply with the construction drawings.

2500 LAND SCAPING ENVIRONMENTAL MANAGEMENT PLAN

The Contractor shall implement the Environmental Management Plan (EMP) measures (Matrix Tables given below both for construction and maintenance and use phases), enhancement measures as directed by the Engineer. He shall submit the report on compliance with the Environmental Mitigation measures periodically to the Engineer. The Engineer will review the compliance submitted by the Contractor.

Environment and Social Management Plan Matrix

(a) Construction Phase

Table 1: Actions Matrix

Item №	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitoring Parameters
1	<u>Degradation of water sources:</u> - Over-abstraction of water, - Water quality degradation, - Effects on downstream dependants, - Stream bed siltation, <u>Sources:</u> - Silt from earth moving, - Oil and grease, - Raw asphalt concrete, - Workshops and machinery maintenance areas, - Construction camp sites,	- Observe regulations on water abstraction permits, slope excavations, etc.), - Monitor standards of sanitation at the construction camps, - Establish a mechanism for solid waste collection, storage, transfer and disposal, - Liaise with water authorities for installation of RGSs at all crossings.	The Contractor, The Resident Engineer. DEO and KURA Engineers. Immediate action and maintained throughout the project period.	- Minimal silt discharging into water bodies, - NO effects on physical status of water quality, - Centralized effective collection of solid wastes	- Status of streams and wetlands and water quality along reserve, - General social Concerns. Specific attention at all crossings and other water bodies.

Item №	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitoring Parameters
	Material preparation sites.				
2.	<u>Air quality:</u> - Dust and particulate matter, - Visual disruption, - Particulate matter, - Surface depositions, - Bronchial and eye problems. <u>Sources:</u> Construction activities (earth moving and machinery operations).	- Ensure earth surface roads, deviations and dry materials are kept damp at all times, - Establish information flow process to the communities on dusty conditions, - Keep inevitable dusty conditions and/or emissions as short as possible,	The Contractor and the Resident Engineer. Surveillance by the, NEMA Officials, DEO and Public Health Officials. Project period	Low visible particulate matter in the air. Requirements of Clause 19 of the General Conditions of Contract	- Dust level within the project, - Exhaust fumes from construction machineries. Project wide situation.

Item No	<u>Anticipated Impacts and Sources</u>	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitoring Parameters
3	<u>Vegetation Cover Degradation:</u> - Removal of vegetation from road reserve and deviation routes, - Loss of vegetation from material sites and access routes, <u>Sources:</u> - Construction of deviations, - Material borrow pits and quarries,	- Collaborate with the Local authorities in their beatification programmes, - Implement top-soiling and grassing programme for the road reserve and material sites, - Introduce soft shrubs in the median of the dual carriage, - Introduce trees on canopies on reserves near built-up areas, - Ensure vegetation does not compromise road safety.	The Contractor and Resident Engineer KURA Engineers and DEO to keep surveillance	Vegetation trend that is also safe to the road users. Requirements of Clause 19 of the standard Bid Docs	Greenery along the route of the road. Special attention at sloppy sections and river crossings will be necessary.

4	<u>Environmental Pollution:</u> • Siltation of water bodies, • Pollution of water (turbidity and hydrocarbons residuals), • Visual pollution (from dust and emissions), <u>Sources:</u> • Oil/grease storage, • Solid waste disposal (filters, greases, asphalt wastes, etc.), • Construction machinery and vehicles, • Excavated earth, • Water abstraction points,	• Develop Standard Operating Procedures (SOPs), schedules and supervision guidelines for the project works, • Focus on sensitive features (e.g. stream crossings and slopes) for necessary precautions, • Establish dust control programme and machinery performance and waste disposal controls,	The Contractor Resident Engineer NEMA offices, water offices and KURA Engineers to keep surveillance.	Minimal disruption to physical and biological environmental quality throughout the route.	• Water quality, • Environmental features, • Risks to health and safety, • Wastes characteristics. Pollutants from camp sites, service yards and material preparation yards.
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Item No	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitoring Parameters
5	<u>Land degradation:</u> • Soil loss, • Soil quality degradation, • Land use changes, • Material sites, Source: • Surface runoff channels from camps and working areas, • Temporary road diversion routes, • Material extraction and transportation.	• Monitor land use trends along the route in liaison with planning department, • Initiate a planned vegetation programme on road reserve, • Rehabilitation plans of materials sites with landowners (lease agreements to reflect this aspect).	The Contractor and the Resident Engineer Surveillance by the KURA Engineers and DEO	Conservation of soils on each side of the road.	Land use trends. A project wide concern, specific locations of camp sites, sloppy zones and crossings. The Contractor to carry out full ESIA for all material sites
6	<u>Health and Safety</u> • Personal injuries (construction employees), • Communicable diseases including HIV/AIDS),	• Provide safety programmes for material sites and working areas,	The Contractor and Resident Engineer. The PPRO,	Information flow and dissemination on health and safety. Specific response to HIV/AIDS issues	Complaints on health safety aspects related to the road construction activities.

	- Potential accidents at material quarries, - Environmental diseases (bronchial and eye problems), Sources: - Construction dust and emissions, - Interaction of construction workers with communities, - Pollution of water from construction activities, - Material sites, - Traffic deviations, - Construction camp sites.	- Provide safety provisions (signage and lighting) for deviations, - Awareness, prevention and training on HIV/AIDS and other social diseases, - Provide service roads and bus at settlement areas to reduce road accidents. - Provide medical, insurance cover and PPEs for all the construction workers.	Surveillance by the DWO, DPHO, and the DEO in Nairobi Entire project period.	Requirements of Clause 19 of the standard Bid Docs Requirements of Clause 34 and 35 of the General Condition Of Contract	Trends in HIV/AIDS cases along the corridor, Special focus on material sites and road diversions routes. Focus on major towns and settlement areas I the project corridor.
Item No	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitoring Parameters
7	Social and Economic: Temporary disruption of business activities,	Enhance consultations with communities on activities affecting them	The Resident Engineer (PPRO) in conjunction with the Contractor,	An acceptable, sustainable and economically viable road with long term benefits to the people	Trends in socio-economic dynamics

	• Insensitivity to public concerns during construction, • Access into and out of highway by special social groups, • Benefits to riparian communities • Safety issues (deviations and materials sites, etc.), • Noise to residents living along the route, Sources: Materials sites, Deviation routes, Construction machineries, Crossings, Construction camps.	- and collaborate on the impacts reduction, • Establish modalities of recruiting manual labour from within the project areas, • Provide service roads and slips accesses, • Locals Authorities for Upperhill area may consider physical planning along the highway for maximum benefits, • Integrate construction works with other projects ongoing in the project route, • The contractor to establish and manage	Liaison with local authorities and the Provincial Administration, Entire construction period	without adverse implications on the physical and social environment.	along the project road and its catchments , Special attention on realigned and expanded sections of the road. Encroached sections will also require attention.
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		environmental and social committee to oversee mitigation measures,			
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Item No	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitoring Parameters
8	<u>Provision of Road Reserve</u>	- Kenya Urban Roads Authority to undertake availability of the road reserve, - Serve adequate quit notices to the encroaching developments	KURA Upon commencement of the project	Clear project route and get back the road reserve.	The design of the road is confined within the 60m. Completed survey will provide actual encroachments and necessary acquisitions.
9	<u>Material Sites (hard stone, gravel and water)</u> - Land degradation, - Loss of land vegetation cover, - Surface hydrology changes, - Access roads' damages,	Full ESIA studies should be undertaken on all materials sites upon final identification, Rehabilitate the material sites after construction. Lease	Contractor and Resident Engineer. DEO and KURA Engineers to supervise	Sustainable abstraction of materials.	It is likely that all material sites will be on private land. Sources of construction water have other uses by the communities.

	- Water sources' degradation, - Water quality.	responsibilities with landowners necessary, Obtain appropriate permits for construction water abstractions	Throughout the construction phase.		
10	<u>Decommissioning</u> - Removal of construction camps, - Materials sites and preparation yards, - Equipment removals.	- Carry out decommissioning audits for the camp sites, - Rehabilitate all material sites and preparation yards, - Remove all construction equipment and excess materials from the site.	The Contractor under supervision of the Resident Engineer, PPRO and the DEOs	Rehabilitated material sites and cleared material preparation yards.	Usability of the affected camps' and material sites.

(b) Road Maintenance and Use

Table 2: Action Plan Matrix (Maintenance and Use)

Item №	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitorable Indicators
1	<u>Environmental Pollution:</u> - Water quality degradation, - Air pollution, - Solid waste dumping (road litter), - Material spills (pollutants), - Vehicular scraps, - Residuals from material sites and preparation yards, <u>Sources:</u> - Surface runoff drains from the road, - Oils spills on road surface,	- Establish a policy and implementation guidelines in close collaboration with experts and NEMA, - Develop monitoring compliance with vehicular emission standards along the road, - Introduce clean-up responsibilities for the road users (e.g. spills from accident vehicle owners), - Provide public waste receptacles at strategic locations along the route	KURA Consultation with the DEO and Water Offices for surveillance, Administration, Traffic Police Department and the Local Authorities.	A road that is compatible with the social conditions and features.	Complaints on the utilization of the roads, Environmental quality trends (status of water sources, water quality and aquatic vegetation), Compliance with road transport regulations.

Item №	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitorable Indicators
	- Road litter (from road users and roadside clearing), - Poorly maintained vehicles – higher related emissions, - Spills from accident sites, - Emerging social and economic centres, - Road repairs and maintenance activities.	(bus stops and crossing areas), - Drainage channels be kept clear at all times to prevent overloading with polluting materials, - Collaboration with the traffic police on enforcement of road regulations.			
Item №	<u>Anticipated Impacts and Sources</u>	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitorable Indicators
2	<u>Health, Safety and Security</u> - Contamination of water and water sources, - Noise and vibrations, - Increased road accidents, - Security aspects,	- Draw strategies for road safety measures and sensitize residents within risk areas, , - Integrate safety measures in the overall maintenance of the road,	KURA Traffic Police department,	Enhanced safety throughout the road and construction of the road to enforce security.	Complaints from the riparian residents, Recorded cases and categories of road accidents,

Item №	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitorable Indicators
	- Spread of infectious diseases (HIV/AIDS and other social diseases) Sources: - Contaminated runoff from the road surface, - Roadside litter and solid wastes, - Increased traffic and driving style variances along the route, - Social interactions, - Inadequate road safety signage and facilities.	- Develop liaison with health provision arms for emergence response on the road, - Liaise with appropriate department to ensure compliance with road regulations and traffic rules along the stretch, - Ensure maintenance of signage and other facilities at all times.	Administration Leadership, Health department and rescue groups. Continuous		HIV/AIDS trends within towns along the route.

Item №	Anticipated Impacts and Sources	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitorable Indicators
3	<u>Social and Economic Aspects</u> - Land use changes due to efficient transport, - Increased settlements and population, - Higher traffic volumes, - Mixed economic activities (general trading, industrial, institutional, etc.), - Road safety issues, - Road ownership by all.	- Collaboration with physical planning Depts. to enhance roadside planning. - Collaborations for sustainable social and economic development, - Include environmental aspects in scheduled road audits.	KURA Continuous process	Compatibility of the road with social and economic interests of the local residents and road users.	Land use trends in time and along the route, Population trends Complaints received from the local communities and the road users in general.

Item No	<u>Anticipated Impacts and Sources</u>	Proposed Actions	Responsibility and Timeframe	Targets to Achieve	Monitorable Indicators
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4	<u>Maintenance</u> • Drainage clearance for free storm water flow, • Vegetation clearing for enhance visibility, • Roadside litter collection, • Road safety facilities and signage maintenance, • Re-encroachment into the road reserve, • Roadside land development practices,	• Establish modalities for the involvement of the riparian landowners in the maintenance of the road, • Install and maintain appropriate road signs. Liaise with other authorities in the control of roadside advertisement billboards that masks the safety signs, • Maintain trash bins at strategic locations along the route (bus stops and major crossing points), • Prepare a maintenance procedure in line with existing guidelines.	KURA DEO, water authorities the Administration for surveillance Continuous process	Maintained high level quality of road surface, installations and components.	
5	<u>Decommissioning phase:</u>	Undertake a decommissioning audit of part, sections or entire	KURA		—

		road reconstruction and establish appropriate measures to prevention environmental pollution and public safety.	After the design road life span (15 – 25 years) Any major repairs along the route.	None or minimum impacts to the environment and social well being	
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2400 TRAFFIC MANAGEMENT AND DIVERSION

2401 General

The Contractor shall prepare and submit to Engineer within one month of the date of commencement of the works a detail traffic diversion plan as per the requirement of traffic authorities. The Contractor shall have to carry out the modifications in the traffic diversion plan at various stages of work as required. The Contractor shall maintain liaison with the traffic/highway police/authorities so as to ensure smooth flow of traffic at all stages of the work without causing inconveniences to the traffic.

2402 Traffic Rotary

The Contractor shall provide traffic rotary showing traffic direction made up of four blinders mounted on M.S. Frame of 5-x50 mm x 6 mm size 250 Hz frequency electrically operated at both ends of the cordoned area for help and guidance of road users. Necessary arrangements for supply of electricity shall be made by the Contractor.

2403 Road Delineates

Road delineates as per the relevant codes and as per the relevant drawings and as directed by Engineer shall be fixed at suitable intervals to have a suitable guidance to the road users at the night time for smooth flow of traffic. Delineators shall be fixed firmly in the ground. Also, red flags and cat eye reflectors shall be fixed on the barricades. Alternative arrangements shall also be kept ready in case of failure of electricity.

2404 Signs, Lights, Barriers and other Traffic Control Devices

Signs, lights, barriers and other traffic control devices shall be provided and maintained in a satisfactory condition till such time that they are not required as directed by the Engineer, so as to ensure smooth and safe traffic on the road throughout the length of the project road.

2405 Barricades

The barricades erected on either side of the carriageway/portion of the carriageway closed to traffic, shall be of strong design to resist violation, and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise.

At the points where traffic is to deviate from its normal path, whether on temporary diversion or part width of the carriageway, the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums or similar devices to the directions of the Engineer. At night, the passage shall be delineated with lanterns of other suitable light source.

2406 Passage through Works**2406.1 One-Way Traffic Operation**

One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns/lights.

2406.2 Two Way Traffic Operation

On both sides, suitable regulatory/warning signs as approved by the Engineer shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 m away. The signs shall be of approved design and of refractory type, if so directed by the Engineer.

2406.3 Traffic Control Devices

Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversions shall be maintained in a satisfactory condition till such time that they are not required as directed by the Engineer. The temporary travelled way shall be kept free of dust by frequent applications of water as necessary.

The details of work which is to be carried out by the Contractor as part of the traffic management during the construction period are given under Bill № 9 of the Bill of Quantities.

2500 SPECIFICATIONS OF MATERIALS AND WORKMANSHIP FOR STREETLIGHTING

2500.1 Scope of Works

This section of the specification covers the supply, installation, connection, testing and commissioning of the street lighting installation in accordance with specifications and bills of quantities.

The Contractor shall include for all apparatus and appliances not particularly called for in this Specification but which are necessary for the completion and satisfactory functioning of the Works. The Engineer may instruct for the installation of a street lighting system comprising of either in part or in totality. The rates in the bills of quantities should be those for installing a solar system in totality.

It is deemed that if, in the opinion of the Contractor at the time of quoting, there existed a discrepancy between the Specification and the actual work, that the Contractor clarified this difference with the Engineer before quoting.

2500.2 Specification

The work shall be executed and completed, unless expressly directed otherwise, in accordance with the following:-

- vii) The specification
- viii) The current edition of the Institution of Electrical Engineers (I.E.E) regulations
- ix) The Electric Power Act of Kenya
- x) The Kenya Power Bylaws
- xi) The British or Kenya Standard specification and relevant and applicable British code of practice.

2500.3 Ordering

The Contractor shall order materials from the quantities taken from his own approved working drawings and not from the quantities shown on in the Specification.

2500.4 Submission of materials and defective work

All materials to be installed must be new and the best of their respective kinds.

The Contractor must examine carefully any materials and /or apparatus submitted to him for installation and/or connection. Any defects detected must be communicated to the Engineer.

2500.5 Samples and defective work

All materials to be used in the installation work must be made available for Inspection and approval and samples must be submitted upon request to the Engineer.

If the Contractor wishes to install or use other types of materials different from those specified in the Contract document, then the manufacturers technical and any other relevant pamphlets must be submitted to the Engineer for consideration and approval.

The right is expressly reserved to order at the Contractors expense the removal from site of all materials not conforming to the specifications and the dismantling and re-execution of all works which by reason of inclusion of improper, specified or defective materials and /or poor class or defective workmanship are a contravention of any clause in the specification.

2500.6 Ratings

Unless specified otherwise stated or where it does not apply all the materials shall be capable of being used on 240 volts 50 Hz. AC single phase and neutral supply.

2500.7 Street Lighting Columns

- i) These shall be manufactured from Class B galvanized steel pipes as per City Council of Nairobi drawing number F45B F45C and shall be complete with doors and brackets. The columns shall be of 10m mounting height from ground level and shall be installed at 1200mm depth on a thick concrete foundation. Space for mounting cutouts and hole for cable entry shall be provided as indicated on the drawing.
- ii) A 20 metre polygonal galvanized high mast pole complete with a lowering mechanism and complete with all the accessories and as per the drawings

2500.8 Lanterns

Lanterns shall be of completely enclosed type designed for side entry mounting on brackets with a nipple of plane tube. They shall be capable of accommodating one single 250 watts HPS-T tubular lamp with a screw type lamp holder connected with heat resisting cables or 120 Watts light emitting diode (LED) lanterns. The lanterns will be with control gear complete with the specified lamp and reflector.

2500.9 System of Wiring

Wiring to poles shall be in PVC/SWA/PVC cables installed in 450mm deep cable trench as per cable size and routes. A layer of soft sand underneath and above the cable laid in trench shall be provided by the Contractor. Fused cut-outs shall be used to loop the cables in pole at lower level and wiring from cut-out to lantern shall be in 1.5mm² twin core PVC insulated sheathed cable with earth. Copper earth clips shall be used on galvanized armouring while looping in poles and earth wire to lantern shall be connected from there by using copper connectors.

"DANGER/HATARI" cable tiles shall be supplied and installed throughout the length of the trench to protect the cables except for the road crossing and plot entrances where cables shall be passed through PVC ducts.

2500.10 Earthing

All poles, lanterns and other metal parts shall be properly earthed. Electrical and Mechanical continuity shall be preserved throughout the whole system from the Consumer unit to the remotest pole and the earth resistance must not exceed 0.5ohms. Every 4th pole shall be efficiently earthed through earth electrode by means of substantial copper clamps secured by non-rusting bolts. The lead must be visible and adequately protected. No earthing lead shall be less than 6mm² in size except for the one used for earthing lanterns where 1.5mm² twin with earth wire shall be used.

Cable glands shall be used at every underground cable termination to bond the Cable armour onto the steel parts of the column and control pillar. The 1.5mm² copper wire of the twin and earth cable shall be used to provide the earth terminal continuity from the lantern to the columns earth terminal.

2500.11 Control Pillar

This shall be a metal pillar manufactured from mild steel to BS 15 as per City Council of Nairobi drawing number F41B. The control pillar shall be installed on 300mm. Thick concrete plinth. The control pillar shall be with all switchgear, interconnections, labels and earthing as approved by the Engineer. The control of the street lighting shall be through a photocell mounted on a 4.6m pole close to the pillar.

2500.12 Testing of the Installation

The Contractor shall carry out tests of the completed installation, copies of the test results shall be provided to the Engineer.

(a) Insulation Resistance

The insulation resistance between line (phase) and neutral, the line (phase) and earth and the neutral and earth shall not be less than one mega ohms when tested.

(b) Earth Continuity

The resistance measured from every earth electrode to the farthest point of the installation shall not exceed 0.5 ohms with 500 volts direct circuit (D.C.) supply.

(c) Earth Electrode Resistance

Test for earth electrode resistance shall not exceed 3 ohms using a null balance tester

(d) Polarity Check

Checks shall be carried out to verify that the neutral is correctly connected and that all fuses and switching (control) devices are connected to the phase (“LIVE”) conductors only.

The Contractor shall be expected to test and inspect the installation particularly those parts that are to be concealed, during the erection, as he shall be held responsible for and shall rectify at his own expense all faults, defects, omissions, faulty workmanship, incorrectly positioned or installed parts of the installation revealed by such inspection and tests.

The Contractor shall provide accurate instruments and/or apparatus and the labour to carry out the above tests independently of any tests made by the Engineer or Kenya Power & Lighting Co. The instruments and apparatus shall be made available to the Engineer for him to carry out the tests as he may require.

The Contractor shall give a seven days’ notice of his intention to carry out the test so as to enable the Engineer to witness the tests if he so wishes.

2500.13 Guarantee of the Installation

The Contractor shall guarantee the whole installation for a period of 12 months from the date of final completion. During this period all defects arising out of faulty materials or workmanship shall be made good free of cost – fair wear and tear expected.

Any contravention of the clauses and conditions of the specifications discovered during the guaranteed period must be corrected free of charge. The submission of the completed Test Form cannot be offered by the Contractor as a final discharge of his responsibilities in respect of the soundness of the installation neither must it be inferred that the readings will necessary be made accepted.

The acceptance of the Form shall in no manner vitiate claims that may subsequently be made under the terms of the guarantee.

2500.14 Clearing of Site and damages

The Contractor must include for the clearing away from site immediately, after completion, all the unused materials and any rubbish or litter as may have been caused by his works.

2500.15 Measurement and Payments

Measurement and payment for all street-lighting works shall be in accordance with the items listed in the Bill of Quantities, the preamble to Bill of quantities and the specifications above.

2600 HIV/AIDS, GENDER, SOCIAL ISSUES AND LOCAL PARTICIPATION**2601 Scope**

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

2602 Interpretation and Documentation

The following documents shall inter-alia be read in conjunction with this specification.

- The instruction to bidders
- The Conditions of Contract
- The drawings

2603 HIV/AIDS Awareness Campaign

The Contractor shall institute an HIV/AIDS awareness campaign amongst his workers for the duration of the Contract. As part of the Campaign the Contractor will be required to display AIDS awareness posters in all buildings frequented by workers employed on the Contract where such buildings fall under the control of the Contractor. In addition, at least ten (10) of the Contractor's vehicles, regularly used on site shall display HIV/AIDS awareness posters. The posters shall be printed on gloss paper and shall be at least A1 size on building and A3 size or other approved size on vehicles. The message on the posters shall be supplied by the Employer through the Engineer before the posters are printed.

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

In the awareness campaign, the Contractor shall employ and designate a safety officer who will undertake and coordinate all aspects of the HIV/AIDS awareness campaign.

2604 AIDS Prevention Campaign

The Contractor shall institute an HIV/AIDS prevention campaign amongst his workers for the duration of the Contract. As part of the campaign the Contractor will be required to make condoms available to workers. The condoms shall be from an approved manufacturer and comply with the current ISO Standards or WHO/UNAIDS Specifications and Guidelines for condoms, 1998, or any more recent equivalent publication. The Contractor shall make available at least 4,000 condoms every month, through dispensing machines or other approved method of distribution. The Contractor shall at all times keep the site adequately supplied with condoms.

As part of the campaign the Contractor shall operate at least one STD and HIV/AIDS clinic on site or make alternative arrangements with an existing suitably qualified and equipped Local clinic. The clinic shall have a minimum of two rooms each at least 10 m² with ablution and washroom. The clinic shall be suitably staffed and equipped for screening, diagnosis and counselling of STD and HIV/AIDS of the project staff and labour. The Contractor shall cover the costs of the clinic to provide free treatment for general STD cases, whereas workers with HIV/AIDS shall be referred to the national HIV/AIDS programme coordinated by the Ministry of Health.

2605 HIV/AIDS Training**2605.1 Objective**

The objective of the AIDS/HIV training programme is to reduce the risk of exposure to and spread of the HIV virus in the Area influenced by the construction project. The target group will be local labourers and their superintendents employed by the works Contractor. The wider community will benefit indirectly through their normal day-to-day interaction with the target group.

2605.2 Scope of activities

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

- Information posters in public places, both on and offsite (eating houses, bars and guest houses) and on the Contractor's vehicles
- Availability of socially marketed condoms
- Peer educators (reference people) drawn from the local labour and educated in HIV/AIDS issues for discussion with colleagues (estimate 1 per 100 employees).

- Small focus group discussions to disseminate information covering key issues
- Theatre groups and video presentations
- Promotional events (such as football matches) to encourage openness and discussion of HIV/AIDS issues.
- Promotional bill boards to raise awareness of the integration of construction and HIV/AIDS activities
- Inclusion of HIV/AIDS activities at site meetings with the Local Aids Committees and other approved representatives.
- Availability of promotional materials including T-shirts, caps, bumper stickers and key rings.

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

- Preventive behaviour including partner reduction, condom use, awareness and appreciation of the importance of treatment of sexually transmitted incidences (STIs)
- Skills including negotiating safer sex, correct condom use, purchase of condoms without embarrassment, and
- Referral to local health centres and available services.

Tasks to be undertaken to support the above activities services shall include:

- Establishing the status and focus of all current and planned HIV/AIDS activities in the area to ensure complementarities and determining potential involvement in project activities
- Carrying out a brief review of regional activities combining road construction with HIV/AIDS campaigns to determine options, best practice key issues and constrains
- Reviewing of Information, Education and Communication (IEC) materials available and their relevance to road construction, making recommendations for future development of IEC materials
- Providing education and training for the site personnel, superintendents and peer educators for the scope of activities as above.

- Providing supervision for peer educators to ensure sustained quality of education and provision of incentives for the scope of activities as above.
- Providing Mechanism for the social marketing of condoms and distribution of materials
- Monitoring activities regularly to assess effectiveness and impact. This should include an initial, interim and final assessment of basis knowledge, attitude and practices (KAP) taking account of the existing data sources and recognizing the limitations due to the short time frame to show behaviour change. The KAP shall be supported by qualitative information from focus group discussion.

2605.3 Collaboration

HIV/AIDS activities are coordinated nationally by the National Aids Control Council (NACC). The Kenya Urban Roads Authority in consultation with NACC and the Ministry of Health (MOH) shall coordinate with the local representatives. Representatives of Local Health Authorities shall be invited to attend training and communication activities.

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

2605.4 Contractor's Responsibilities

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

- Scheduling appropriate timing and durations of the implementation of HIV/AIDS activities as part of work plan for labourers and superintendents.
- Designated rest times such as lunch breaks and paydays shall be excluded.
- Identification of suitable individuals from recruitment records for education with the implementing organization
- Provision of suitable sites for communication activities and for condom distribution
- Monitoring of the implementation of peer educator activities, and
- Provision of support as necessary to the implementing organization.

2605.5 Inputs

An organization experienced in the provision of HIV/AIDS awareness and prevention activities shall be selected as a subcontractor to provide the above scope of activities on behalf of the main Contractor.

2605.6 Reporting

The implementing organization shall produce the following reports to be submitted to the Contractor, Consultants, Ministry of Roads, Kenya Urban Roads Authority and NACC:

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

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

The final report and recommended approach will be presented to the Ministry of Roads, Kenya Urban Roads Authority, NACC and other interested organizations including private sector, funding agencies and Non-Governmental Organisations.

2606 Timing

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

2607 Measurement and Payment

The payment items in this Clause shall include full compensation for all work associated with the provision of HIV/AIDS related services as specified.

Item: Instituting an HIV/AIDS awareness campaign

Unit: Months

The unit of measurement shall be the calendar month or part thereof, measured over the duration of the campaign. The rate shall include for providing a Safety Officer to deal with HIV/AIDS together with his/her transport requirements. The payment shall be made monthly, pro-rata for parts of a month, from the date of appointment of the officer until the completion of the works or substantial demobilization of the local workforce whichever comes first.

Item: Instituting an HIV/AIDS prevention campaign

Unit: Months

The unit of measurements shall be the month. The rate shall include the cost of providing a clinic or make alternative suitable arrangements, running the clinic, providing condoms as per the specifications and meeting all the costs of time related costs.

The payment shall be made monthly, pro-rata for parts of a month, from the date of establishing the clinic until the completion of the works or substantial demobilization of the local workforce whichever comes first.

Payment shall only be made for periods during which the Contractor has effectively provided the services.

Item: HIV/AIDS training

Unit: Provisional Sum

Payment shall be made for the actual expenditure incurred by the Contractor for which receipted vouchers shall be produced. The rate shall include full compensation for equipment, labour and material required for the provision of the services.

In addition, the Contractor will be paid for handling, overheads and profit at a percentage (%) rate of the receipted expenses incurred.

SECTION 10: BILLS OF QUANTITIES

PREAMBLE TO BILL OF QUANTITIES

1. The Bill of Quantities shall form part of the Contract documents and is to be read in conjunction with Instructions to Bid, Conditions of Contract, Specifications and Drawings.
2. The brief description of the items in the Bill of Quantities is purely for the purpose of identification, and in no way modifies or supersedes the detailed description given in the Conditions of Contract and specification for the full direction and description of work and materials.
3. The Quantities set forth in the Bill of Quantities are estimated and provisional representing substantially the work to be carried out and given to provide a common basis for bidding and comparing the bids. There is no guarantee to the Contractor that he will be required to carry out all the quantities of work indicated under any one particular item or group of items in the Bill of Quantities. The basis of payment shall be the Contractor's rates and the quantities of work actually done in fulfillment of his obligation under the Contract.
4. The prices and rates inserted in the Bill of Quantities will be used for valuation of the work executed and the Engineer will measure the whole of the works executed in accordance with this Contract.

A price or rate shall be entered in link against every item in the Bill of Quantities with the exception of items which already have provisional sums affixed thereto. The bidders are reminded that no "nil" or "included" rates or "lump-sum" discounts will be accepted. The rates for various items should include discount if any. Bidders who fail to comply with this will be disqualified.
5. Provisional Sums (including Day works) in the Bill of Quantities shall be expended in whole or part at the discretion of the Engineer in accordance with Sub clause 52.4 and Clause 58 of the Conditions of Contract.
6. The price and rates entered in the Bill of Quantities shall, except insofar as it is otherwise provided in the Contract, include all constructional plants to be used, labour, insurance, supervision, compliance, testing, materials, erection, maintenance of works overhead and profit, taxes and duties together with the general risks, liabilities and obligations set out or implied in the Contract, transport, electricity and telephone, water, use and replenishment of all consumables, including those required under the Contract by the Engineer and his staff.
7. Errors will be corrected by the Employer for any arithmetic error in computation or summation as stipulated under Clause 28 of the Instructions to Bidders.

8. The Bill of Quantities, unless otherwise expressly stated therein, shall be deemed to have been prepared in accordance with the principle of the latest edition of the Civil Engineering Standard Method of Measurement (CESMM)
9. “Authorised” “Directed “or “Approved” shall mean the authority, direction or approval of the Engineer.
10. Unless otherwise stated, all measurement shall be net on the finished work carried out in accordance with the details shown on the drawings or instructed, with no allowance for extra cuts or fills, waste or additional thickness necessary to obtain the minimum finished thickness or dimensions required in this Contract. Any work performed in excess of the requirements of the plans and specifications will not be paid for, unless ordered in writing by the Engineer.
11. Hard/rock materials in this Contract, shall be defined as the material which, in the opinion of the Engineer, require blasting, or the use of metal wedges and sledge hammers, or the use of compressed air drilling for their removal, and which cannot be extracted by ripping with a dozer tractor of at least 150 brake horse power (112 kilowatt) with a single rear-mounted hydraulic ripper
Boulders of more than 0.2 m³ occurring in soft materials shall be classified as hard material (m)
Soft materials shall be all material other than hard material as defined under Item (l) above.(n)
The units of measurement and abbreviations tabulated below are used herein

Unit	Abbreviation
Number	No
Millimetre	mm
Square millimetre	mm ² / sq mm
Metre	m
Square metre	m ² / sq m
Cubic metre	m ³ / cu m
Hectare	ha
Kilogramme	kg
Lump sum	LS
Prime Cost	PC
Tonne	Tonne
Metric ton (1000 kg)	t / tonne
Degrees centigrade	°C
Hour	h / hr

Week	wk
Month	nth
Horsepower	HP
Kilowatt	KW

BILL № 1: Preliminary and General Items					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
1.01	Provide and maintain Engineer's main office as shown on the drawings or as instructed by the Engineer for use during the duration of the Contract.	Lump sum	1		
1.02	Provide and maintain furniture and equipment for the Engineer's office as well as survey equipment as specified for the Contract period and as detailed in Appendix to Bill Item № 1.03.	Lump sum	1		
1.03	Allow a provisional sum of KShs. 1,000,000 for Material Testing as directed by the Engineer	Prov. Sum	1	1,000,000.00	1,000,000.00
1.04	Extra Over on Item 1.03 for the Contractor's Overheads and Profit.	%			
1.05	Provide with driver and maintain one (1) New Type 2 vehicle, minimum 2.8 litre turbocharged 4-wheel drive, twin- cab pick-up vehicle or similar approved by the Engineer, fitted with air bags, mobile telephone hand free headset and a two way radio for the exclusive use of the Engineer inclusive of the first 4,000 km per vehicle month.	V. month	24		
1.06	Extra Over on Item 1.05 inclusive of fuels, maintenance, lubricants and servicing for kilometrage over 4,000 km per vehicle month.	km	8,000.00		
1.07	Provide with driver and maintain two (2) New Type 3 vehicle, minimum 2.8 litre 4-wheel drive, single-cab pick-up vehicle (with canvas back seat) or similar approved by the Engineer, fitted with air bags, mobile telephone hand free headset and a two way radio for the exclusive use of the Engineer inclusive of the first 4,000 km per vehicle month.	V. month	48		

1.08	Extra Over on Item 1.07 inclusive of fuels, maintenance, lubricants and servicing for kilometrage over 4,000 km per vehicle month.	km	4,000.00		
1.09	Allow a Provisional Sum of KShs 2,000,000 for the Engineer's miscellaneous account to be spent in whole or part as instructed by the Engineer and to be reimbursed against receipts.	Prov. Sum	1	2,000,000.00	2,000,000.00
1.10	Extra Over on Item 1.09 for the Contractors Overheads and Profit.	%			
1.11	Provide, erect and maintain publicity signs as instructed by the Engineer.	Nº	2		
1.12	Allow for attendance upon the Engineer by the following staff in accordance with Clause 137 of Special Specification (Check the minimum rates provided in the special specifications)				
	(i) Assistant Engineer	M.mth	18		
	(ii) Inspector of works	M.mth	36		
	(iii) Laboratory Technicians	M.mth	18		
	(iv) Survey Assistants	M.mth	18		
	(v) Levellers	M.mth	36		
	(vi) Laboratory Assistants	M.mth	18		
	(vii) Chainmen	M.mth	36		
	(viii) Environmentalist/Sociologist	M.mth	36		
	(ix) Office Assistant	M.mth	36		
	(ix) Secretary	M.mth	36		
	(x) General Attendants	M.mth	48		
1.13	Include a percentage on Item 1.12 for the Contractor's Overheads and Profit.	%			
1.14	Allow a Provisional Sum of KShs 600,000 for the Engineer's staff mobile phone airtime charges	Prov. Sum	1	600,000.00	600,000.00
1.15	Include a percentage on Item 1.14 for the Contractor's Overheads and Profit	%			
BILL 1 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 4: Site Clearance and Topsoil Stripping					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
4.01	Clear site on road reserve including removal of trees,hedges, bushes, and other vegetation or deleterious organic material , grub up roots in accordance with the specifications	Ha	7		
4.02	Remove upto 0.2m top soil including removal of all grass, transport to spoil and spread or stockpile for re-use as directed by the Engineer	m³	14,400		
4.03	Excavate, remove and dispose existing 1200mm, 900mm, 600mm and 300mm dia pipe culverts including the inlet and outlet structures as directed by the Engineer	m	500		
4.04	Demolish concrete structures along the road corridor and dispose of the material	m³	200		
4.05	Take down and re-erect fences as directed by the Resident Engineer	m	1,200		
4.06	Provide a provisional sum of KShs 5,000,000 for relocation of services.	Prov. Sum	1	5,000,000.00	5,000,000.00
4.07	Include a percentage on Item 4.06 for the Contractor's Overheads and Profit				
BILL 4 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 5: Earthworks					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
	No separate payments shall be made for the overhaul of the material and the cost of such haulage shall be included in the rates and or prices.				
5.01	Cut to spoil in soft materials as directed by the Engineer.	m ³	57,600		
5.02	Cut to fill in soft material, including benching of shoulders and embankments to 95% MDD (AASHTO) as directed by the Engineer.	m ³	5,000		
5.03	Scarify, water, process and compact 150 mm existing ground below embankments or subgrade to 95% MDD (AASHTO T99)	m ³	1,200		
5.04	Provide, fill, process and compact in soft material from borrow pits	m ³	32,400		
5.05	Provide, fill and compact in hard material as per the standard specifications.	m ³	22,500		
5.06	Provide, spread, water, process and compact 300 mm improved subgrade to 100% MDD (AASHTO T99) in two layers of 150 mm thickness.	m ³	10,800		
5.07	Provide, fill and compact Rock fill as per the standard specifications.	m ³	5,000		
BILL 5 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 8: Culvert and Drainage Works					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
	No separate payment shall be made for the haulage of surplus or unsuitable excavated material and the cost of such haulage shall be included in the rates and/or prices				
8.01	Excavate in soft material to the range of depths stated below for pipe culverts, subsoil drains, headwalls, wing walls, aprons, toe walls, drop inlets, mitre drains, catch water drains and median drains including support of trench sides, backfilling and compacting as specified or as instructed by the Engineer.	m ³	15,000		
8.02	As Item 8.01 but in hard material	m ³	12,000		
8.04	Provide, lay and joint 300mm or 450 mm I.D. Reinforced Cement Concrete pipes for Service ducts as per the drawings or as instructed by the Engineer	m	600		
8.05	Provide, lay and joint 600 mm I.D. Reinforced Cement Concrete pipes	m	1,000		
8.06	Provide, lay and joint 900 mm Internal Diameter (I.D.) Reinforced Cement Concrete pipes	m	800		
8.07	Provide, lay and joint 1200 mm I.D. Reinforced Cement Concrete pipes	m	150		
8.08	Provide and place RC Class 15/20 concrete for use as bed, haunch and surround, including formwork	m ³	600		
8.09	Provide and place A142 fabric mesh reinforcement or equivalent for item 8.07	m ²	400		
8.10	Provide and place RC Class 20/20 concrete for side drains including formwork and provision and placing of reinforcement as shown on the drawings or as instructed by the Engineer	m ³	1,700		

8.10	Provide and joint 600x360mm precast concrete invert block drain (IBD) channels with two double side precast side slabs of 600x225x75mm as lining for side drain including bedding and backfilling with selected material as directed by the Engineer.	m	1,000		
8.11	Provision of stone pitching including grout	m ²	15,000		
8.12	Provide, place and compact rock fill below culverts	m ³	1,000		
BILL 8 SUB-TOTAL CARRIED TO SUMMARY PAGE					

BILL № 9: Passage of Traffic					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
9.01	Provide and maintain the signs and barriers for safe passage of traffic				
	(i) Signage	№	20		
	(ii) Barricades - drum type	№	20		
	(iii) Barricades - steel portable	№	10		
		№			
9.02	Allow for the passage of traffic through the works	Prov. Sum	3		
9.03	Provide, spread, water, process and compact to 95% MDD (AASHTO T180) gravel of sub base quality on deviations, thickness 150mm.	m ³	1,800		
BILL 9 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 12: Natural Material for base/subbase					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
12.01	Provide, lay, water and compact Natural material of base quality on footpaths and various sections as directed by the Engineer with all leads and lifts complete shown in the Book of Drawings complete with approved specifications or as instructed by the Engineer.	m3	8,100		
12.02	Provide, lay and compact 200mm hand packed stone for subbase and base including filling of voids with stone dust and watering as directed by the Engineer.	m3	18,000		
BILL 12 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 15: Bituminous Surface Treatments and Surface Dressing					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
	<i>Note: No haulage will be paid for bitumen, chippings or sand this should be included in the rates billed rates.</i>				
15.01	Clean and prepare surfaces of main carriageway, slip roads, shoulders, bus bays, accesses and junctions, provide, heat and spray on the same MC 70 cutback bitumen prime coat at a rate of spray in the range of 1.0 litre/m ² to 1.2 litres/m ² or as instructed by the Engineer	litre	45,000		
15.02	Clean and prepare surfaces of main carriageway, slip roads, shoulders, bus bays, accesses and junctions, provide, heat and spray two coats of K1-60 bitumen emulsion as tack coat on the bituminous layer in Item 15.01 at a spray rate in the range of 0.3 litre/m ² to 0.8 litre/m ² or as instructed by the Engineer	litre	56,250		
BILL 15 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 16: Bituminous Mix Bases, Binder Courses and Wearing Courses					
16.01	Prepare surfaces, provide, mix, lay and compact 50mm Asphaltic Concrete (AC) (Type 1) as binder course on sub base with bitumen and 0/14 mm aggregates on prepared surface of asphalt sub base layer	m ³	1,800		
16.02	Prepare surfaces, provide, mix, lay and compact 35mm Asphaltic Concrete (AC) (Type 1) as wearing course on base with bitumen and 0/14 mm aggregates on prepared surface of asphalt base layer	m ³	1,260		
BILL 16 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 17: Concrete Works					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
17	CONCRETE				
17.01	Provide, place and compact class 15/20 for blinding	m ³	35		
17.02	Provide, place and compact concrete Class 25/20 for trenches, drains, retaining walls, toe walls, head walls, wing walls and aprons	m ³	1,000		
17.03	Provide, place and compact concrete Class 30/20 for retaining walls, base, slab, abutments and piers	m ³	250		
	FORMWORK				~
	Provide, erect and afterwards dismantle and remove				~
17.03	Vertical formwork to achieve class F3 finish	m ²	150		
17.04	Vertical formwork to achieve class F2 finish	m ²	120		
17.05	Vertical formwork to achieve class F1 finish	m ²	200		
17.06	As item 17.04 but horizontal	m ²	100		
17.07	As item 17.05 but horizontal	m ²	100		
					~
	REINFORCEMENT				~
	Provide, bend and fix into position				~
17.08	High yield steel bars to BS 4461 of sizes 16mm and above	Tonne	110		
17.09	As item 17A.07 but of size 12mm and below	Tonne	60		
BILL 17 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 20: Road Furnitures					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
20.01	Provide and lay hot applied thermoplastic road marking compound in approved colour and shade (ASTM 9) for road marking on bituminous surface on centerline, 100 mm, edge line 150 mm wide 3.0 mm thick, using fully automatic extrusion machine and using pre-melter for melting thermoplastic material including cleaning the surface of all dirt, dust, and other foreign matter, complete with demarcation at site/pre-marking, finishing and managing the traffic movements. Marking to be done as per the specifications, detailed drawings and as instructed by the Engineer.				
	(i) For lane marking (broken lines) with yellow paint, 100 mm wide	m ²	500		
	(ii) For edge lines (continuous line) with white paint, 150 mm wide	m ²	750		
20.02	Providing and applying two coats of synthetic enamel paint including primer to kerbs as per the Technical Specifications and as instructed by the Engineer.	m	5,000		

20.03	Provide and lay hot applied thermoplastic road marking compound in approved colour and shade (ASTM 9) for road marking on bituminous road surface on pedestrian crossings, chevrons, directional arrows, give way and stop lines mm thick using fully automatic extrusion machine and using pre-melter for melting thermoplastic. Material, including dispensing drop on glass beads of approved make and as per BS 6088 at the rate of 250g/m ² including cleaning the surface of all dirt, dust, and other foreign matter, complete with demarcation at site/ pre-marking, finishing and managing the traffic control. Marking to be done as per the specifications, drawings and as instructed by the Engineer.	m ²	500		
	Permanent Road Signs				
20.04	Supply and fix regulatory/mandatory road sign boards made up with high intensity grade retro-reflective type sheeting (ASTM 9) complete as per the drawings and Technical specifications.	No	15		
20.05	Supply and fix cautionary/warning road sign boards made up with high intensity grade retro-reflective type sheeting (ASTM 9) complete as per the drawings and Technical Specifications	No	20		
20.06	Supply and fix informatory road sign boards made up with high intensity grade retro-reflective type sheeting complete as per drawing and Technical specifications.				
	(i) Area less than 1.0 m ²	No	10		
	(ii) Area more than 1.0 m ² but less than 2 m ²	No	10		
20	Other Road Furniture				

20.07	Provide and lay cement concrete kerb/divider for central reserve, footpaths and traffic islands in concrete Class 25/20 as per the drawings and as instructed by the Engineer complete with all leads and lifts. Pre-cast/cast-in-situ kerb / divider				
	(i) Barrier type	m	9,000		
	(ii) Flush	m	15,000		
20.08	Excavate for, provide, lay and joint 100mm x 125mm wide precast concrete channels to radius greater than 12m and laid on 100mm thick concrete class 15/20 bed and haunch as specified	m	6,000		
20.09	Excavate in any material for, provide all materials, supply and install bollards 150mm diameter class A black pipes circular hollow sections 6mm thick, 200mm diameter with brackets welded at base and filled with compacted concrete class 10/15 and 1:3 cement mortar conical coping on top to the Engineer's satisfaction. The pipes shall be 1000mm long with 550mm protruding above the ground and the part above ground painted black with a 300mm white reflective strip.	No	20		
20.1	Provide a provisional sum for Kshs. 10,000,000.00 for provision of street lighting	Prov. Sum	1		
20.11	Extra Over on Item 20.11 for the Contractor's Overheads and Profit.				
BILL 20 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 22: Day Works					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
Note:	<i>Any plant employed upon Day works which have power rating lower than that specified, shall be paid for at rates lower than those in the Schedule of Day works. The reduction in the payable rate shall be in proportion to the power rating below that specified.</i>				
22.01	Crawler Dozer with Hydraulic Ripper				
	(a) 100-135 Kw rated flywheel power	hr	10		
	(b) 136-185 Kw rated flywheel power	hr	5		
	(c) 186-250 Kw rated flywheel power	hr	5		
22.02	Motorized rubber tyred single engine scrapers				
	(a) Up to 16m ³ heaped capacity	hr	5		
	(b) 17-26 m ³ heaped capacity	hr	5		
22.03	Motorized rubber tyred twin engine scrapers				
	(a) Up to 16 m ³ heaped capacity	hr	5		
	(b) 17-26 m ³ heaped capacity	hr	5		
22.04	Motor Graders with Hydraulic Ripper or Scarifier				
	(a) 80-110 Kw rated flywheel power	hr	5		
	(b) 111-120 Kw rated flywheel power	hr	8		
	(c) 121-160 Kw rated flywheel power	hr	5		
22.05	Tracked Excavator Cranes				
	(a) 20-28t max working load	hr	5		
	(b) 28.1-36.1t max working load	hr	5		
	(c) 36.1-56t max working load	hr	5		
22.06	Excavators hydraulic wheeled dual purpose				
	(a) 0.6-0.8m ³ rated bucket capacity	hr	5		
	(b) 0.81-1.0m ³ rated bucket capacity	hr	8		
22.07	Wheeled loaders 4X4 articulated				
	(a) 1.5-2.0 m ³ SAE rated capacity	hr	5		

	(b) 2.01-3m ³ SAE rated capacity	hr	5		
	(c) 3-5 m ³ SAE rated capacity	hr	5		
22.08	Crawler Loaders with Hydraulic Ripper				
	(a) 0.8-1.3m ³ SAE rated capacity	hr	5		
	(b) 1.31-1.99 m ³ SAE rated capacity	hr	5		
	(c) 2-2.5 m ³ SAE rated capacity	hr	5		
22.09	Rollers Towed vibratory including tractor				
	(a) 6.5-8.8 t un-ballasted weight	hr	5		
	(b) 8.6-11.7 t un-ballasted weight	hr	5		
22.10	Road Roller deadweight (Steel Three Wheel)				0
	(a) 6.5 -8.8 t un-ballasted weight	hr	5		
	(b) 8.6-11.7 t un-ballasted weight	hr	5		
22.11	Roller rubber tyred self-propelled				
	(a) up to 1 t per wheel	hr	5		
	(b) 1.1 t ~2.0 t per wheel	hr	5		
22.12	Roller Vibratory single roll Rubber tyred, 8.3-10.5 t un-ballasted weight	hr	8		
22.13	Vibrating plate compactor 114-200 kg operating weight	hr	5		
22.14	Compressor rated by normal delivery of free air per minute complete with all tools				
	(a) 6.0-7.4 m ³ /min	hr	5		
	(b) 7.5-9.7m ³ /min	hr	5		
	(c) 9.8-25.5m ³ /min	hr	5		
22.15	Mobile rubber tyred rough terrain crane 23-40 t max working load	hr	5		
22.16	Small dumpers 751kg-1.2t max rated payload	hr	5		
22.17	Pumps(Inclusive of all hoses				
	(a) 50-76mm delivery	hr	5		
	(b) 77-101mm delivery	hr	5		
22.18	Rubber tyred tractors including trailer. 50-70kw rated flywheel power	hr	5		
22.19	Concrete mixers (wet capacity)				0
	(a) up to 100 litres	hr	5		
	(b) 101-200 litres	hr	5		
	(c) 201-300 litres	hr	5		

22.20	Transit Mixer 4.5 m ³ /hour	hr	5		
22.21	Concrete pump of 45 and 30 m ³ capacity	hr	5		
22.22	Concrete poker vibrator	hr	5		
22.23	Concrete pump of 45 and 30 m ³ capacity	hr	5		
22.24	Lorries - Flatbed				
	(a) up to 7.5t gross vehicle weight	hr	5		
	(b) 7.6-12.0t gross vehicle weight	hr	5		
22.25	Lorries - Tippers				
	(a) up to 11t gross vehicle weight	hr	5		
	(b) 11-17t gross vehicle weight	hr	5		
	(c) 17.1- 25t gross vehicle weight	hr	10		
22.26	Van, Pickup or similar utility vehicle				
	(a) up to 1 t carrying capacity	hr	5		
	(b) 1.1-2.6 t carrying capacity	hr	5		
22.27	Self-propelled water or fuel tanker				
	(a) 3500-4550 litre capacity	hr	5		
	(b) 4551-7000 litre capacity	hr	5		
	(c) 7001- 12000 litre capacity	hr	5		
22.28	Bitumen pressure distributor				
	(a) 3500-4550 litre capacity	hr	5		
	(b) 4551-9000 litre capacity	hr	5		
22.29	Hot mix plant - 60 tonnes per hour	hr	5		
22.3	Wet mix plant - 60 tonnes per hour	hr	5		
22.31	Hydrostatic paver & finisher with sensor control	hr	5		
22.32	Batching and mixing plant 15-20 m ³ capacity	hr	5		
22.33	Concrete paver finisher with 40 HP motor	hr	5		
22.34	Chip spreader	hr	5		
22.35	Mechanical broom	hr	5		
22.36	Kerb making machine	hr	5		
22.37	Road marking machine	hr	5		
22.38	Electric generator				
	(a) 100 KVA	hr	5		
	(b) 125 KVA	hr	5		
22.39	Crusher Plant	hr	5		
22.4	Pulvimixer	hr	5		
22.41	LABOUR				
	(a) Unskilled Labour	hr	15		
	(b) Skilled Labour	hr	5		

	(c) Artisan	hr	5		
	(d) Plant Operator	hr	15		
	(e) Driver	hr	15		
	(f) Foreman	hr	15		
	(g) Office attendants and chainmen	hr	5		
	(h) Blaster (Certified)	hr	5		
	MATERIALS				
	All items of materials must be priced to comply with the Specifications.				
22.42	Ordinary Portland Cement	tonne	2		
22.43	Hydrated Lime	tonne	2		
22.44	Mild Steel				
	(a) Up to and including 16 mm diameter	tonne	2		
	(b) Over 16 mm diameter	tonne	2		
22.45	High Yield Steel				
	(a) Up to and including 16mm diameter	tonne	2		
	(b) Over 16mm diameter	tonne	2		
22.46	Aggregates for Concrete				
	(a) Fine	m ³	15		
	(b) coarse	m ³	15		
22.47	Shuttering Timber				
	(a) F1 finish	m ²	10		
	(b) F2 finish	m ²	20		
	(b) F3 finish	m ³	15		
22.48	Chippings				
	(a) Class 3 any size	m ³	5		
	(b) fine aggregate	m ³	5		
22.49	Cutback Bitumen and emulsion				
	(a) 80/100 penetration grade bitumen	litre	15		
	(b) MC 3000 cut-back bitumen	litre	15		
	(c) MC 70 cut-back bitumen	litre	15		
	(d) K-160 bitumen emulsion	litre	15		
22.5	Gabion mesh, size 1.0 m x 1.0 m x 1.0 m	m ²	5		
22.51	Stone for gabions	m ³	5		
BILL 22 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 25: Landscaping and Environmental Mitigation Measures					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
25.01	Allow a provisional sum of KShs 500,000.00 for carrying out an EIA, Environmental Monitoring and Environmental Audit for the project including Implementation of the Environmental Management plan and payment of NEMA license as instructed by the Engineer.	Prov. Sum	1	500,000.00	500,000.00
25.02	Extra Over on Item 25.01 for the Contractor's Overheads and Profit.				
25.03	Supply, stack and spread approved earth and manure at site including royalty and carriage up to 15 m as instructed by the Engineer.	m ³	1500		
25.04	Supply, stack, plant and water flowering/avenue trees of at least 1m height above the ground level in excavated pits of size 1.2m x 1.2m x 1.2m and after planting, removal and stacking of excavated earth to approved location, filling the pit with soil for large and small trees as instructed by the Engineer.	№	100		
25.05	Provide, plant and develop the plants, shrubs and flower bed on embankment slopes, inside the embankment and as shown on the drawing in excavated pits of size 0.6 x 0.6 x 0.6 and after planting removal and staking of excavated pits / bed with appropriate material				-
	(a) Medium shrubs	№	100		
	(b) Small shrubs	№	100		

25.06	Transplantation of the existing trees of girth above 600 mm girth as instructed by Engineer, including uprooting, shifting of the tree and placing in excavated pits of suitable size and after transplanting, removal and stacking of excavated earth to approved locations as instructed by the Engineer. Rate to include maintenance of transplanted trees including watering, including labour, all tools and equipment and maintaining up to defect liability period as instructed by Engineer up to the end of the defect liability period.	N _o	10		
25.067	Grassing as instructed by the Engineer. Rate to include care and watering of the grass until it is firmly established to the satisfaction of the Engineer.				
	(a) Approved "runner" species of indigenous species of grass	m ²	1000		
25.08	Provide, plant and develop the lawn in approved variety grass including excavating the existing soil to maximum depth 30 mm removing and stacking of excavated earth to instructed location, dressing the soil in proper slope, mound, fitting the excavation	m ²	7		
25.09	Landscaping of embankment slopes, cut faces, side drains of outfall channels, shoulders, spoil and borrow areas. Rate to include light compaction of the landscaped areas to the satisfaction of the Engineer.	m ²	1000		
25.10	Compensatory road side plantation of approved species of indigenous trees including MS tree guard, watering, manure, maintenance during the construction and defect liability periods or as instructed by the Engineer.	N _o	100		
25.11	Provide and lay crazy stones as per the direction of the Engineer	m ²	100		

25.12	Monitor Air quality for SPM, PM10, SO ₂ , NO _x , CO & HC in each season with a frequency of 24 hr/day for two consecutive working days per week for two weeks during construction period at three locations as instructed by the Engineer.	No of samples	2		
25.13	Monitor Noise levels once in every season for two non-consecutive days per week for 2 weeks with an interval of 10 minutes for 24 hr at three locations as instructed by the Engineer.	No of samples	2		
25.14	Test water quality at two locations along the project for pH, BOD, TSS, TDS, DO, turbidity and O&G once in each season or as instructed by the Engineer.	No of samples	4		
25.15	Test soil quality for heavy metals and oil & grease at the start and end of construction activity at the relevant sections as instructed by the Engineer.	No of samples	5		
BILL 25 TOTAL CARRIED TO SUMMARY PAGE					

BILL № 26: HIV/AIDS Awareness					
ITEM	DESCRIPTION	UNIT	QUANTITY	RATE (KSH)	AMOUNT (KSH)
26.01	Implement HIV/AIDS awareness campaign amongst the workers for the duration of the Contract	month	18		
26.02	Allow for the availability of condoms to workers and staff for the duration of Contract	month	18		
26.03	Allow for the participation of representative of local health authorities, provincial director of health and National AIDS council to train and communicate with workers. Allowance to include transport, meals, accommodation and any other reasonable allowances associated expenses and equipment expenses	month	18		
26.04	Allow for the engagement of HIV specialist (Clinical Officer) to deal with prevention and awareness activities as per programme to be approved by the Engineer	month	18		
26.05	Allow for the preparation and submission of monthly report for HIV/AIDS awareness and prevention activities report to be tabled at site meetings	month	18		
26.06	Allow a PC sum of Kshs. 3,000,000.00 for Training for Engineers as specified by the Engineer	PC Sum	1	3,000,000.00	3,000,000
26.07	Include a percentage on Item 26.06 for the Contractor's Overheads and Profit.	%			
BILL 26 TOTAL CARRIED TO SUMMARY PAGE					

SUMMARY OF BILLS OF QUANTITIES		
BILL No.	DESCRIPTION	AMOUNT (KES)
1	GENERAL	
4	SITE CLEARANCE AND TOPSOIL STRIPPING	
5	EARTHWORKS	
8	CULVERTS AND DRAINAGE WORKS	
9	PASSAGE OF TRAFFIC	
12	NATURAL MATERIALS FOR SUB BASE AND BASE	
15	BITUMINOUS SURFACE TREATMENT AND SURFACE DRESSING	
16	BITUMINOUS MIX BASES BINDER COURSES AND WEARING COURSES	
17	CONCRETE WORKS	
20	ROAD FURNITURE	
22	DAY WORKS	
25	LANDSCAPING AND ENVIRONMENTAL MITIGATION MEASURES	
26	HIV AWARENESS	
A	SUB TOTAL A	
B	Add of 2.5% for VOP	
C	Add of 2.5% of Subtotal for physical contingencies.	
D	SUB TOTAL B =(A+B+C)	
E	Add 16% VAT of SUB TOTAL B	
	GRAND TOTAL CARRIED TO FORM OF TENDER (D+E)	

SECTION 11: DRAWINGS

