KENYA RAILWAYS

KENYA URBAN MOBILITY IMPROVEMENT (KUMIP)

TERMS OF REFERENCE FOR INDIVIDUAL CONSULTANT- MECHANICAL ENGINEERING EXPERT

IDA NO: KE-KRC-548694-CS-INDV

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Table of Contents

ABBREVIATION

Term	Meaning
AFCS	Automated Fare Collection Systems
BEMU	Battery Electric Multiple Units
CHMP	Cultural Heritage Management Plan
ERP	Enterprise Resource Planning
ESS	Environmental & Social Commitment Plan
ESIA	Environmental & Social Impact Assessment
ESMF	Environmental & Social Management Framework
ESS	Environment and Social Safeguards
FEED	Front-End Engineering Design also known as Basic Engineering
GOK	Government of Kenya
KR	Kenya Railways
KUMIP	Kenya Urban Mobility Improvement Project
LMP	Labour Management Procedure
MDBs	Multilateral Development Banks
NCR	Nairobi Commuter Railways
NEMA	National Environment Management Authority
PIT	Project Implementation Team
RAP	Relocation Action Plan
RPF	Resettlement Policy Framework
SA	Sexual Assessment
SEA	Sexual Exploitation & Abuse
SHP	Sexual Harassment Plan
SRA	Sexual Risk Assessment
SEP	Stakeholder Engagement Plan
TA	Technical Assistance
TOD	Transit Oriented Development

Terms of Reference for Mechanical Engineering Expert Consultant for Support to the Kenya Urban Mobility Improvement Project

1 Background

Kenya Railways (KR) is a State Corporation established in 1978 pursuant to the Kenya Railways Act, Cap 397 Laws of Kenya. It is mandated to develop an integrated rail network and provide rail and inland waterways transport services in the Country.

The Government of Kenya (GOK) has applied for financing from World Bank toward the cost of the Kenya Urban Mobility Improvement (KUMIP) and intends to apply part of the proceeds for consulting services. The project financing agreement is subject to the World Bank's Procurement Regulations for Investment Project Financing (IPF) Borrowers, Goods, Works, Non-Consulting and Consulting Services, Seventh Edition, September 2025.

The Nairobi Metropolitan Area faces significant urban mobility challenges including traffic congestion, inadequate public transport Infrastructure, and limited multi-modal connectivity. The Kenya Urban Mobility Improvement Project aims to address these challenges by improving commuter rail services.

The project development objectives are to improve urban mobility services in the catchment area of Nairobi Metropolitan Area and enhance institutional capacity for resilient and a green urban transport development in Kenya. The major components of KUMIP relevant to this assignment include:

Component 1: Urban Mobility Improvement in the Nairobi Metropolitan Area

a) Revamping the Commuter Rail Service

- Comprehensive upgrade of signalling and train control systems, telecommunications infrastructure, and electrical power systems;
- Conduct feasibility study, Front-end Engineering Design (FEED)/Basic Engineering Design, and preparation of bidding documents for upgrading of the Nairobi commuter rail network with emphasis of signalling, telecommunication and electrical systems;
- Track rehabilitation, upgrading/construction and capacity enhancement of the Nairobi Central Station- Thika line, including assessment of signalling, telecommunication and electrical infrastructure impact and compatibility requirements;

- Improved access to railway-to-railway stations including deployment of fibre-optic telecommunication backbones and power distribution networks to support Non-Motorized Transport (NMT) facilities and feeder bus services.
- Purchase new multiple trainsets, associated equipment and spare parts with full compatibility verification between rolling stock on-board system and wayside signalling/telecommunication equipment;
- Establishment of a workshop for maintenance of new trainsets including dedicated signalling testing laboratory, telecommunication diagnostic equipment and electrical testing facilities;
- Improve and develop selected stations along stations along the Nairobi Central Station- Thika line, including multimodal interchange facilities integrated with telecommunication and power infrastructure;
- Develop Enterprise Resource Planning (ERP) Architecture for KR including communication system integration for real-time rail operations, maintenance management, and asset tracking;
- Support KR in implementing Automated Fare Collection System (AFCS) with integration to platform screen doors/gates and associated signalling interlocks where applicable.

b) Green Mobility Solution

- Carry out detailed design of Battery Electric Multiple Unit (BEMU) or hybrid electric trains with comprehensive electromagnetic (EMC) management and revised electrical infrastructure requirements;
- Support implementation of e-mobility policy and technical assistance for e-bus deployment business models;

Component 2 Transit-Oriented Development along Commuter Rail. The key activities are: -

- TOD planning, station accessibility improvement, and implementation support;
- Institutional strengthening for TOD.

Component 3: Institutional strengthening and capacity building in urban mobility

This component will support institutional strengthening in urban mobility, providing technical assistance to Ministry of Roads and Transport, Kenya Railways Corporation and NAMATA.

KR has prepared detailed Terms of Reference for the Feasibility Study and FEED/Basic Engineering Design for the entire NCR network. The consultant for FEED/Basic engineering design is expected to complete the feasibility study within 24 months of signing the contract with priority being given to the Nairobi-Thika line (line 2).

KR wishes to engage the services of a Mechanical Engineering Expert as an individual expert to provide technical assistance in mechanical engineering for the project for a period of **12 person-months** (Level of Effort) during the feasibility study and FEED/Basic Engineering design phases. The scope will include rolling stock systems, on-board railway systems, power systems, transmission equipment, air compressors, and mechanical piping systems compliant to EN 13501 and US-specific NFPA 130 mechanical systems, and fire alarm and detection systems compliant to NFPA 72, NFPA 130 standards or EN equivalents.

The individual consultant will provide technical support as an advisor, not as the designer of record, to the Project Implementation Team (PIT) throughout the project cycle. The individual consultant shall report to the Project Team Leader.

2 Objectives of the Consultancy Services

The objective of this consultancy is to;

i. Provide technical expertise, advisory and project management support to PIT;
ii. Review feasibility study reports, designs, specification and bidding documents submitted by the consulting firm;
iii. To determine targets such as MDBF, fleet availability, and energy efficiency;
iv. Advise the PIT on international best practices to be adopted in the feasibility study and FEED/Basic design, with adherence to quality standards, and how to achieve project goals on schedule and within budget.

3 Scope of Services

The scope of service for Individual Consultant shall include the following;

i) Provide technical support on all mechanical engineering and related activities within the project, including rolling stock, track systems, and associated equipment.
ii) Review of feasibility study reports, including inception report, draft feasibility report, final feasibility report, preliminary design FEED/Basic Engineering designs and RAMS mechanical risk assessments.
iii) Develop evaluation matrices with weighted criteria and then review the consultant's output, including bidding documents and to ensure that clear evaluation criteria (performance, maintainability, obsolescence) is guaranteed.

iv) Review and propose relevant international standards, specifically for rolling stock subsystems such as EN 14752 (doors), ISO 15848 (valves), and EN 45545 (fire protection), for rail mechanical equipment (rolling stock, plant, and equipment).
v) Provide input on materials, mechanical components, corrosion fatigue (ISO 12944), cyclic loading evaluation, and systems integration.
vi) Review technical specifications and performance requirements of reliability, maintainability, availability, energy consumption metrics, including MDBF targets and HVAC COP thresholds, for the procurement of rolling stock and mechanical systems.
vii) Provide recommendations based on Weibull analysis or FRACAS methodology to improve the reliability, availability, and performance of rolling stock and infrastructure.
viii) Support capacity building of KRC staff on railway civil engineering, based on identified needs and agreed priorities.
ix) Provide technical advisory services on railway mechanical engineering to KRC, as requested.

4 Outputs and Deliverables

In line with the scope, the Mechanical Engineering expert will deliver the following outputs:

i. Progress/ad hoc reports using a KRC-specified content outline.
ii. Prepare the checklist for and then review Technical Reports on feasibility studies/FEED/Basic Engineering designs, and bidding documents, and a prepare report on the findings.
iii. Reports on compliance with international rail standards and best practices in rolling stock engineering systems.
iv. A final report upon project completion summarizing outcomes, maintainability indices, obsolescence analysis, performance metrics, LCC recommendations, supplier dependency analysis, lessons learnt and future recommendations.

These deliverables shall serve as indicators of progress and performance and shall not constitute payment milestones under this time-based contract

5 Assignment Duration and Location

5.1 Assignment Duration

The total Level of Effort (LoE) is 12 person-months over a period of 24 months coinciding with the duration of the feasibility study and FEED/Basic Engineering Design phase. The Consultant's inputs shall be intermittent and demand-driven, based on project needs. The Consultant will undertake tasks as agreed with the Client, each assigned an indicative number of person-days prior to commencement. These person-days may be adjusted

through prior consultation and mutual agreement between the Consultant and the Client. The Consultant shall not exceed the agreed LoE ceiling without prior written approval from the Client.

5.2 Mode of Engagement

The assignment shall be implemented under a Time-Based Contract for Individual Consultants in accordance with the World Bank Procurement Regulations for Investment Project Financing. Payments shall be based on actual time inputs (person-days) multiplied by agreed remuneration rates, subject to satisfactory performance.

5.3 Assignment location

The in-country assignment will be primarily based in Nairobi, Kenya, at Kenya Railways offices. Periodic site visits to the Nairobi-Thika rail corridor and associated project sites will be required. Remote working arrangements may be accommodated for specific tasks such as document reviews, per agreement with the Client and ensuring effective communication and responsiveness.

6 Qualifications and Experience

The individual expert shall be a suitably qualified and experienced professional mechanical engineer, with the following qualifications and skills.

Minimum Qualifications:

i. Bachelors of Science degree in Mechanical Engineering, Electrical engineering or equivalent from a recognized higher learning institution.
ii. Minimum of 15 years of professional experience, with at least 10 years rolling-stock-focused experience and at least 5 years in rail transport projects, specifically experience in the design, procurement, inspection, testing and commissioning of urban commuter rolling stock.
iii. In-depth knowledge of rolling stock, propulsion systems – DC/AC traction, auxiliary systems, braking systems, HVAC systems, and related mechanical systems.
iv. Knowledge of international railway standards (e.g., UIC, AAR, AREMA, ISO, EN/TSI Loc & Pas and EN 45545-fire safety).
v. Must be a registered Professional Engineer with the Engineers Board of Kenya, or equivalent regulatory body from the country of origin/residence of the expert and a CPD log of at least 30 hours per year.
vi. Familiarity with Kenya Railways' rail infrastructure and standards is an added advantage.

Desired Skills and Competencies

i. Proven record of accomplishment of working on railway passenger and freight rolling stock in tropical climate reliability considerations.

ii. Expertise in modern tools such as advanced drawing and design software and simulation software such as ANSYS and MATLAB/Simulink.
iii. Have work experience in the design and implementation of railway mechanical and electrical mobility systems, especially mechatronics interfaces for rail pneumatic systems and brake logic.
iv. Must have work experience in design specification, implementation, testing and commissioning of rolling stock, railway plant and equipment.
v. Be knowledgeable and have exposure to international practices in rolling stock, signalling, communication, and on-board equipment, specifically the ability to interface mechanical on-board devices to signalling networks.
vi. Have work experience in the conceptualization of design, preparation, implementation and management of railway systems, rolling stock and associated plant and equipment, and mandatory dynamic commissioning experience with evidence of thermal and brake testing reports.
vii. Ability to exercise sound and timely judgment.
viii. Exceptional interpersonal skills and effective communication, both orally and in writing;
ix. Experience in a rail construction environment for plant and maintenance depots;
x. Analytical and problem-solving skills using RCA and 8D methodologies;
xi. Presentation, reporting, editing, and proofreading skills; and
xii. Leadership and administrative skills.

7 Reporting

7.1. Reporting structure

The Individual Consultant shall report directly to the Project Team Leader of the Kenya Railways Project Implementation Team (PIT). The reporting structure is designed to ensure effective coordination, timely decision-making and clear accountability throughout the assignment.

7.2. Working Relationships

The Consultant will work closely with and interface with the following entities:

- Kenya Railways Project Implementation Team (PIT) - primary client and day-to-day coordination;
- FEED/Basic Engineering Design Consultant - technical reviews and design discussions;
- Kenya Railways Operations Department - operational requirements input;
- Kenya Railways Engineering and Technical Services Department - maintainability and lifecycle considerations;

- World Bank Task Team - periodic progress updates and safeguards compliance;
- Other project consultants and technical specialists as required.

7.3. Coordination mechanisms

- Bi-weekly technical coordination meetings with FEED consultant during active design periods;
- Monthly progress meetings with PIT senior management;
- Ad-hoc technical workshops and review sessions as required by project milestones.

7.4. Decision making authority

The Consultant shall:

- Have authority to request additional information and clarifications from the FEED consultant;
- Provide technical recommendations and approval/non-approval recommendations to PIT;
- Escalate critical technical issues requiring management decisions to Project Team Leader;
- Not have direct contractual authority over the FEED consultant - all formal communications shall be channelled through PIT.

7.5. Quality Assurance

The Consultant's work will be subject to quality assurance review by the Project Team Leader. The World Bank may conduct periodic supervision missions and review the Consultant's technical outputs as part of project oversight activities.

8 Schedule of Payments

8.1 Payment Basis

Payments shall be made monthly based on actual person-days worked, supported by invoices and certified timesheets approved by the Project Team Leader. The minimum threshold for payment certification is 10 person-days.

8.2 Payment Frequency

Payments shall be made monthly, subject to submission and approval of timesheets and brief progress reports.

8.3 Contract Ceiling

The total payments shall not exceed the ceiling corresponding to twelve (12) person-months (264 person-days).

8.4 Approval of Payments

All payments shall be subject to approval by the Project Team Leader.

8.5 Reimbursable Expenses

Reimbursable expenses shall be limited to pre-approved travel and subsistence costs and shall be reimbursed at actual cost upon submission of supporting documentation.

8.6 Estimated Time-Input

The table below presents the estimated time-input for the assignment. The allocation of person-days below is indicative only and may be adjusted based on assignment requirements. It does not constitute payment milestones.

Table 1: Indicative Level of Effort Allocation

Item	Activity	Activity Description	Output / Deliverable	Estimated Expert Input Duration (Person-Months)
1	Inception Phase	Review and familiarization with all relevant project documents, contracts, and feasibility study inception report and any other technical support related to the project	Expert's Inception Report and comments as applicable	1
2.1	Feasibility Study	Review of Draft Feasibility Reports (as per Section 3(vii)) and any other technical support related to the project	Review Report on Draft Feasibility Study and comments as applicable	1
2.2	Feasibility Study	Review of Final Feasibility Reports (as per Section 3(vii))	Review Report on Final Feasibility Study	1
3	FEED / Basic Engineering Design (Corridor Level)	Review of Designs / FEED / Basic Engineering Reports and Bid Documents for Nairobi–Ruiru–Thika Line, Access Roads, and TOD and any other technical support related to the project	Review Report on FEED / Basic Engineering Designs and Bid Documents (Nairobi–Ruiru–Thika) and comments as applicable	2

Item	Activity	Activity Description	Output / Deliverable	Estimated Expert Input Duration (Person-Months)
4.1	Network-Wide FEED Review	Review of Interim Design / FEED / Basic Engineering Report for Entire Commuter Rail Network, Access Roads, and TOD and any other technical support related to the project	Review Report on Interim FEED and comments as applicable	1
4.2	Network-Wide FEED Review	Review of Draft Final Design / FEED / Basic Engineering Report for Entire Commuter Rail Network, Access Roads, and TOD and any other technical support related to the project	Comments and Review Report on Draft Final FEED and comments as applicable	2
4.3	Network-Wide FEED Review	Review of Final Design / FEED / Basic Engineering Report and Bid Documents for Entire Commuter Rail Network, Access Roads, and TOD and any other technical support related to the project	Comments and Review Report on Final FEED and Bid Documents and comments as applicable	1
5	Investment Program	Review of Investment Program for NCR Network, Station Areas, Access Roads, and Transit-Oriented Development	Review Report / Comments on Proposed Investment Program and comments as applicable	1
6	Operations, Safety & Security	Review of Operations, Safety, and Security Plans and any other technical support related to the project	Review Report on Operations, Safety, and Security Plans and comments as applicable	1
7	Capacity Building & Completion	Input into Capacity Building Program for Counterpart Staff and Verification of	Capacity Building Review & Completion Report	1

Item	Activity	Activity Description	Output / Deliverable	Estimated Expert Input Duration (Person-Months)
		Completion Deliverables and any other technical support related to the project	and comments as applicable	
	Total			**12**

8.7 Withholding of Payments

Payments may be withheld in case of unsatisfactory performance or missing reports.

8.8 Time Records and Audit

Time records may be audited by KR and the World Bank.

8.9 Currency of Payment

Payment shall be made in Kenya Shillings with a USD option for expatriate consultants.

9 Provision of Required Facilities

KR shall:

i. Provide office space, with access to internet, printing, photocopying and document binding,
ii. Provide guaranteed access to vehicles & depots,
iii. Provide the requisite data and other information available within the company required by the individual expert for the assignment,
iv. Assist the individual expert in accessing information from other organizations required for the assignment;
v. Facilitate transportation and accommodation costs if the expert is required to travel in the execution of the assignment, as per existing company guidelines.

10 Obligations of the Consultant

10.1 Professional standards

The Consultant shall:

- Comply with Kenya Railways code of ethics

10.2 Resource provision

The Consultant shall:

- Provide all necessary resources including laptop computer, software licenses, technical reference materials, and professional subscriptions required to execute the assignment;
- Maintain access to international railway standards and technical literature necessary for comprehensive design review;
- Ensure availability and responsiveness throughout the assignment duration according to agreed time commitments

10.3 Quality Assurance

The Consultant shall:

- Ensure that all deliverables meet contractual requirements and professional quality standards;
- Conduct thorough self-review and quality checks before submission of reports and technical documents;
- Ensure technical outputs are consistent with contractual requirements, professional standards, legal frameworks, and international best practices;
- Respond to Client comments and revise deliverables as required within agreed timelines.

10.4 Communication and coordination

The Consultant shall:

- Maintain regular communication with the Project Team Leader and report on assignment progress;
- Immediately notify the Client of any issues that may affect deliverable quality, schedule, or budget;
- Participate in coordination meetings, technical workshops, and review sessions as scheduled;
- Maintain professional and constructive working relationships with all project stakeholders.

10.5 Confidentiality and Data Security

The Consultant shall:

- Maintain strict confidentiality of all project information, data, and documents not in the public domain;
- Sign a Non-Disclosure Agreement (NDA) with Kenya Railways prior to commencement of services;
- Implement appropriate cybersecurity measures to protect sensitive project data, particularly information related to signalling systems, telecommunication network architecture, and security-sensitive infrastructure details;

- Not disclose, reproduce, or utilize confidential information for purposes other than this assignment without prior written consent from Kenya Railways;
- Return or securely dispose of all confidential documents and data upon completion of the assignment.

10.6 Health Safety and environment

The Consultant shall:

- Comply with all applicable health, safety, and environmental regulations during site visits and field activities;
- Use required personal protective equipment (PPE) and follow KR safety protocols when accessing operational railway infrastructure;
- Report any safety incidents or near-misses immediately to the Project Team Leader

10.7 Conflict of Interest

The Consultant shall:

- Disclose any actual or potential conflicts of interest that may arise during the assignment;
- Not have any business or financial relationships with the FEED consultant or potential bidders for the design-build contract;
- Maintain independence and avoid any activities that could compromise objectivity in technical reviews and recommendations.

10.8 Compliance with laws and regulations

The Consultant shall comply with all applicable laws, regulations, and administrative requirements of the Republic of Kenya, as well as World Bank procurement and safeguards policies applicable to the assignment.