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PROJECT TITLE

Construction of Duct Banks, Pull Pits, and Pedestals or Electrical Infrastructure

DOCUMENT TITLE

Scope of Work

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1 GENERAL OVERVIEW

The Lake Kivu Compressed Natural Gas (CNG) Project, located on the Rwanda–DR Congo border along Lake Kivu, aims to extract dissolved methane gas from the lake's deep waters using surface barges. The methane will be transported to an onshore facility in Karongi District, Western Province, Rwanda, for refinement into CNG, which will then be distributed nationally.

The scope includes construction of reinforced concrete-encased duct banks with PVC sleeves (Ø200 mm) for LV, MV, and control cables; pedestals for cable racks and lighting supports; interlocking pavers for interim office parking; Ruliba brickwork boundary finishes; and steel railing installations per Schedule No. 7 (BoQ and drawings).

Pedestals will be built in existing masonry retaining walls (partial demolition) and underground (excavation and casting). Pull pits beyond road cross-sections require partial demolition and drainage channel reconstruction.

All work complies with approved drawings, project specifications, and relevant standards.

2 ABBREVIATIONS

Table 1. List of abbreviations used in the document

No	Abbreviations	Meaning
1	PVC	Polyvinyl Chloride Pipes
2	LV	Low Voltage
3	CI	Control and Instrumentation
4	MV	Medium Voltage
5	PCC	Plain Cement Concrete
6	OPM	Optimum Moisture Percentage
7	pH	Potential of Hydrogen
8	QA/QC	Quality Assurance/ Quality Control
9	HSE	Health, Safety and Environment
10	ITP	Inspection and Test Plan

3 APLICABLE STANDARDS AND CODES

Table 1. List of Specifications and Codes applicable to the Works

Standard	Title	Publication Year
BS EN 933-1	Particle size distribution – Sieving method	1997
BS EN 933-2	Particle size distribution – Sedimentation method	1997
BS EN 933-3	Particle shape – Flakiness index	2012
BS EN 933-4	Particle shape – Shape index	2008
BS EN 933-5	Percentage of crushed and broken surfaces	2022
BS EN 933-7	Shell content determination	1998
BS EN 1097-1	Particle density and water absorption	2011
BS EN 1097-2	Resistance to fragmentation	2010
BS EN 1097-3	Loose bulk density and voids	2000
BS EN 1097-4	Particle density and water absorption	2013
BS EN 1097-5	Percentage of crushed and broken particles	2010
BS EN 1097-6	Particle density and water absorption	2013
BS EN 1367-4	Drying shrinkage	2008
ASTM C142	Clay lumps and friable particles in aggregates	2017(Reapproved 2023)
RS/EAS 1792003	Specification for concrete paving blocks/pavers	2003
BS EN 1338	Concrete paving blocks – Requirements and test methods	2003

4 REFERENCE ANNEXES

The following Schedules are applicable to the Scope of Work and execution of the Works. The Contractor shall read these in conjunction with the Scope of Work.

Table 2. List of Schedules applicable to the Scope of Work and execution of the Works

Schedule No.	**Title**
1	Scope of Work
2	Project Schedule (Contractor to provide)
3	Schedule of Rates
4	Ancillary Construction Works- General Quality Requirements
5	Project Controls and Reporting Requirements
6	Change Order and Rates (Contractor to provide)
7	BOQ and Construction Drawings.
8	Contractor's Inspection and Test Plan (Contractor to provide)
9	Agreed Sub-Contractors (Contractor to provide)
10	Health Safety and Environmental Requirements
11	Not Used
12	Certificate of Provisional Completion
13	Certificate of Final Completion
14	Site Plan
15	Project Description

5 DETAILED SCOPE OF WORK

5.1 Duct Bank Construction (Including Pull Pits and Drainage Reconstruction)

The Scope of Work includes the following activities

5.1.1 Excavation and Preparation

Perform excavation in all types of soil to the required depth, alignment, and side slopes as per approved drawings. Include excavation for pull pits at designated locations beyond road cross-sections, ensuring stability with proper shoring, bracing, or benching. Carry out dewatering as needed to keep excavations dry.

5.1.2 Surplus Soil Disposal

Transport and dispose of excess excavated material to a designated disposal site provided by the Owner within 3 km of the Project Site.

5.1.3 PCC Bedding

Place 50 mm thick PCC (M15) bedding at the base of the trench

5.1.4 Supply and Installation of PVC Sleeves

Install PVC pipes (Ø200 mm) PN 10 as per drawings. Ensure proper spacing, alignment, and support to maintain correct positioning during concrete pouring.

5.1.5 Reinforcement

Fix reinforcement cages for the duct bank walls, slab, and pull pits.

5.1.6 Concrete Encasement

Pour and compact reinforced concrete (M25) around the PVC sleeves and for pull pits. Maintain clear cover and ensure no movement of pipes during pouring.

5.1.7 Pull Pits

Construct reinforced concrete pull pits with appropriate covers, entry sleeves, and cable management features as per design.

5.1.8 Drainage Demolition and Re-construction

Where duct banks and pull pits intersect existing drainage channels, carefully demolish the affected portions. After completing the duct bank and pull pit works, rebuild the demolished drainage sections using materials and profiles matching the existing structure to ensure proper flow alignment and structural integrity.

5.1.9 Backfilling

After curing, backfill with suitable material in compacted layers meeting specified densities.

5.2 Pedestal Construction for Cable Racks and Street/Aerial Light Supports

This work involves constructing reinforced concrete pedestals to support cable racks, street lighting poles, and aerial light structures. Pedestals will be either integrated into existing masonry retaining walls or built as buried standalone foundations, all in accordance with approved drawings and specifications.

5.2.1 Pedestals in Existing Masonry Walls

Covers the construction of reinforced concrete pedestals within existing masonry retaining walls, including partial demolition and integration with the existing structure while maintaining wall stability.

a) Demolition

Carefully cut and demolish portions of existing masonry retaining walls at designated pedestal locations. Ensure structural stability of the remaining wall is not compromised;

b) Excavation

Where needed, excavate in all types of soil with proper side slopes as per approved drawings to form foundations for pedestals;

c) Rebar Fixing

Fix reinforcement as per drawings. Ensure proper anchorage with existing masonry walls;

d) Anchor Bolts / Insert Plates Installation

Supply and install anchor systems (cast-in anchor bolts or cast-in steel insert plates) as per approved drawings and specifications.

- Anchor Bolts: Bolts shall be of approved grade (minimum yield strength 8.8 or as specified), hot dip galvanized for corrosion protection, and set accurately in position using rigid templates to maintain correct alignment, projection, and spacing prior to concreting. Ensure bolts remain fixed in position during casting and achieve the required embedment depth and tolerance. After concreting, base plates shall be grouted with non-shrink grout, ensuring full bearing and no voids.
- Insert Plates: Plates shall be fabricated from approved structural steel grade, complete with welded headed studs, dowels to ensure full load transfer into the concrete pedestal. Plates shall be protected against corrosion. Plates shall be set accurately to line, level, and position using suitable supports and templates, ensuring the specified embedment and clear cover to reinforcement. After curing, connections to the insert plates shall be carried out by approved welding procedures, with all welds inspected and protective coatings reinstated using compatible zinc-rich primer or equivalent.

e) Concrete Casting

Cast pedestals in-situ with M25 concrete to the specified dimensions and

f) Finishing

Provide smooth form finish with chamfered edges as indicated.

5.2.2 Buried Pedestals

Covers the construction of buried reinforced concrete pedestals in excavations to specified depths and dimensions, ensuring proper reinforcement, formwork, concreting, and backfilling.

a) Excavation

Excavate in all types of soil to the required depth, with side slopes as per approved drawings. Dewatering shall be done as required;

b) Surplus Soil Disposal

Transport and dispose of excess excavated material to the designated Owner-provided disposal area (within 3 km);

c) Reinforcement and Formwork

Fix reinforcement cages and place formwork as per details;

d) Anchor Bolts / Insert Plates Installation

Supply and install anchor systems (cast-in anchor bolts or cast-in steel insert plates) as per approved drawings and specifications.

- Anchor Bolts: Bolts shall be of approved grade (minimum yield strength 8.8 or as specified), hot-dip galvanized for corrosion protection, and set accurately in position using rigid templates to maintain correct alignment, projection, and spacing prior to concreting. Ensure bolts remain fixed in position during casting and achieve the required embedment depth and tolerance. After concreting, base plates shall be grouted with non-shrink grout, ensuring full bearing and no voids.
- Insert Plates: Plates shall be fabricated from approved structural steel grade, complete with welded headed studs, dowels to ensure full load transfer into the concrete pedestal. Plates shall be protected against corrosion. Plates shall be set accurately to line, level, and position using suitable supports and templates, ensuring the specified embedment and clear cover to reinforcement. After curing, connections to the insert plates shall be carried out by approved welding procedures, with all welds inspected and protective coatings reinstated using compatible zinc-rich primer or equivalent.

e) Concrete Casting

Cast pedestals in-situ with M25 concrete, ensuring proper consolidation and

f) Backfilling

Backfill and compact around pedestals after curing.

5.3 Paver Installation for Interim Office Parking and Other Locations

This work covers the construction of paved surfaces using interlocking concrete pavers for interim office parking areas and other designated locations. The process includes site preparation, sub-base compaction, sand bedding, paver laying, edge restraint construction, and joint filling, all in compliance with RS EAS 1792003 standards and approved design specifications.

5.3.1 Supply and Install

Provide interlocking concrete pavers of dimensions 100 mm (width) × 200 mm (length) × 80 mm (height) meeting RS EAS 1792003 standards and approved colour specifications.

5.3.2 Preparation

Excavate and level the designated parking and other specified areas. Provide and compact a sub-base layer (150 mm thick, crushed stone compacted to ≥95 % OPM).

5.3.3 Sand Bedding

Place and screed a 30 mm layer of fine sand as bedding for pavers.

5.3.4 Installation

Lay pavers in the approved pattern ensuring tight joints and correct alignment. Use mechanical compaction to ensure full seating of pavers.

5.3.5 Edge Restraints

Install concrete edge restraints to maintain paving stability.

5.3.6 Joint Filling

Sweep fine sand into joints and re-compact to achieve interlock.

5.4 Ruliba Brickwork at Boundary Wall (Gate House Toilets)

This work involves the construction of brickwork using Ruliba clay bricks for the boundary wall adjacent to the Gate House toilets. Activities include surface preparation, bricklaying, mortar application, alignment control, and finishing, all in accordance with approved drawings, specifications, and workmanship standards.

a) Preparation

Clean and prepare the boundary wall surface to receive brickwork;

b) Brick Supply

Provide Ruliba clay bricks of approved quality, dimensions, and finish as specified;

c) Installation

Lay bricks in the specified pattern using mortar (14 cement-sand mix), ensuring proper alignment, level, and joint thickness and

d) Finishing

Point all visible joints neatly and clean the surface after installation.

5.5 Railing Work at Designated Locations

This work covers the fabrication and installation of metal railings at specified project locations. Activities include material preparation, cutting, welding, surface treatment, alignment, anchoring, and finishing, all in compliance with approved drawings, specifications, and safety standards.

a) Supply

Provide 50 mm diameter mild steel pipes for railing fabrication, meeting Project standards for strength and durability;

b) Fabrication and Installation

Construct railings to a height of 1.2 m as per approved drawings. Ensure proper anchoring into the base (concrete);

c) Painting

Apply anti-corrosion primer and two coats of approved exterior-grade paint. Paint colour shall be as approved by the Owner and

d) Inspection

Ensure all railings are securely fixed, with smooth finishes and no sharp edges for user safety.

6 MAJOR EXCAVATIONS

This work involves carrying out extensive excavations to prepare working areas for duct banks, pull pits, and pedestal installations. Activities include safe excavation in all soil types, provision of shoring and bracing where required, dewatering, and proper management of excavated materials in compliance with approved drawings and project specifications.

a) Excavation Scope

Large-scale excavations to create working spaces for duct banks, pull pits, and pedestal installations shall be carried out in all types of soil, with side slopes strictly following approved drawings;

b) Shoring and Safety

Provide temporary shoring, bracing, or benching where required to prevent soil collapse. Ensure safe access for workers and equipment;

c) Dewatering

Maintain excavations free of water through appropriate dewatering measures during construction and

d) Soil Management

Stockpile reusable soil as directed by the Owner. Surplus soil shall be disposed of at a designated disposal site (within 3 km) provided by the Owner.

7 MATERIALS AND STANDARDS

This section defines the quality requirements and standards for all materials used in the construction of duct banks, pull pits, pedestals, and associated works. Compliance with these specifications is essential to ensure structural integrity, durability, and performance in accordance with Project requirements.

7.1 Backfill Requirements

Backfill materials used for trench and pedestal backfilling shall meet strict criteria to ensure compaction, stability, and protection of installed ducts and structures. The backfill must support loads without excessive settlement or deformation and provide adequate drainage to prevent water retention. Backfill shall be free of organic matter, debris, and oversized particles to maintain compaction quality and prevent damage to conduits.

Characteristic	Specification
Maximum particle size (Dmax)	50 mm
Bulking CBR	<1 %
Plasticity Index	<15
Max compacted layer thickness	25 cm
Minimum compaction rate	≥95 % OPM
CBR at 95 % modified compaction (96 h soaked)	≥25

7.2 Fine Aggregate (Sand) Requirements

Fine aggregates used in concrete and bedding must conform to established standards to provide strength, durability, and workability. Sand with appropriate grading and cleanliness improves concrete mix consistency and reduces segregation.

Test	Standard	Limit
Grading	BS EN 933 Part 1	0/4 or 0/2
Shell content	BS EN 933 Part 7	≤10 % (2.36–5 mm)
Specific gravity	BS EN 1097 Part 6	≥2.6
Water absorption	BS EN 1097 Part 6	≤3 %
Clay lumps	ASTM C142	≤1 %
Chloride content	—	≤500 mg/L
Sulphate content	—	≤400 mg/L
Silt content	—	≤3 %
Soundness	BS EN 1367 Part 4	≤18

7.3 Coarse Aggregate (Gravel) Requirements

Coarse aggregates contribute to concrete strength and durability. Proper grading, shape, and cleanliness reduce voids and improve bond between aggregate and cement paste.

Test	Standard	Limit
Grading	BS EN 933 Part 1	4/20, 2/14 or 10/20, 6.3/14, 4/10
Shell content	BS EN 933 Part 7	≤3 % (>2.36 mm)
Fines	BS EN 933 Part 5	0
Flakiness	BS EN 933 Part 3	≤35
Specific gravity	BS EN 1097 Part 6	≥2.6
Water absorption	BS EN 1097 Part 6	≤2 %
Clay lumps	ASTM C142	≤2 %
Aggregate crushing value	—	≤35
Resistance to abrasion (LA)	BS EN 1097 Part 1	≤35
Soundness	BS EN 1367 Part 4	≤18
Chloride content	—	≤500 mg/L
Sulphate content	—	≤400 mg/L

7.4 Water Requirements

Water used in all concrete mixing and curing shall be clean, free from harmful impurities, and compliant with relevant standards to avoid detrimental effects on concrete strength and durability.

Test	Limit
Chlorides	<500 mg/L
Sulphates	<500 mg/L
Dissolved solids	<2000 mg/L
pH	6.5–9
Alkali carbonates/bicarbonates	<500 mg/L

7.5 Reinforcement Steel Requirements

Reinforcement steel shall conform to grade B500B or equivalent, meeting strength and ductility requirements to ensure structural integrity and safety.

Property	Specification
Grade	B500B
Yield Strength (fyk)	500 MPa
Modulus of elasticity (Es)	200,000 MPa
Poisson's ratio	0.3
Shear modulus of elasticity (Gs)	76,900 MPa

7.6 Paver Specifications (RS EAS 1792003)

Property	Specification	Standard
Dimensions	100 mm × 200 mm × 80 mm	RS EAS 1792003

Compressive strength	Mean ≥ 35 MPa; No individual < 30 MPa	RS EAS 1792003 / RS 415/ EN 1338:5.3
Water absorption	≤ 6 %	RS EAS 1792003
Abrasion resistance	≤ 20 mm loss	BS EN 1338
Colour and finish	As approved by Owner	—

7.7 Ruliba Clay Bricks

Property	Specification
Compressive strength	≥ 15 MPa
Water absorption	≤ 15 %
Efflorescence	Nil to slight
Dimensions	As per Ruliba factory standards
Mortar mix	14 (cement sand)

7.8 Steel Pipes for Railings

Property	Specification
Pipe diameter	50 mm
Wall thickness	≥ 3 mm
Steel grade	Mild steel
Surface treatment	Two coats primer plus Two coats enamel
Paint colour	As approved by Owner

8 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

This section outlines the measures and procedures that will be implemented to ensure all works meet the specified standards, approved drawings, and project quality requirements. It covers material testing, workmanship inspections, documentation, and continuous improvement processes.
Refer to the schedule no 4 for Ancillary Construction Works- General Quality Requirements.

9 INSPECTION AND TEST PLAN (ITP)

This section establishes the framework for systematic inspection and testing activities to verify compliance with design specifications, materials standards, and workmanship quality. The ITP serves as a control mechanism to identify and correct defects early, ensuring that all works meet contractual requirements and industry best practices.
Refer to the schedule no 4 for Ancillary Construction Works- General Quality Requirements.

10 HEALTH, SAFETY AND ENVIRONMENT (HSE)

This section defines the mandatory health, safety, and environmental management requirements to protect all personnel, the public, and the environment throughout the execution of duct bank and pedestal construction works. Compliance with HSE standards is essential for legal conformity, accident prevention, and sustainable Project delivery.
Refer to the schedule no 10 for HSE Requirements.

11 DOCUMENTATION AND REPORTING

11.1 Daily Progress Reports

The Contractor shall prepare and submit daily progress reports to the Owner and Consultant. These reports shall include

a) Work performed during the day (excavation, concreting, backfilling, etc.);

b) Weather conditions affecting work;

c) Workforce and equipment on site;

d) Any delays, issues, or safety incidents and

e) Photographic evidence of ongoing works at critical stages.

11.2 Material Test Reports

The Contractor shall submit all laboratory test certificates and material quality reports for approval prior to incorporation into the works. This includes tests on concrete, reinforcement steel, aggregates, water quality, and backfill materials as detailed in Sections 4 and 5.

11.3 Inspection and Test Records

Complete records of all inspections and tests performed according to the approved Inspection and Test Plan (ITP), including hold point inspections and test results, shall be maintained and submitted for review.

11.4 Method Statements and Work Procedures

Prior to the commencement of key activities such as excavation, concreting, demolition, and backfilling, the Contractor shall submit detailed method statements and risk assessments for Owner/Consultant review and approval.

11.5 HSE Reports

Regular health, safety, and environment reports documenting compliance, incidents, and corrective actions shall be submitted in accordance with the Project's HSE requirements.

11.6 As-Built Documentation

Upon completion of duct banks, pull pits, pedestals, and drainage reconstruction works, the Contractor shall prepare and submit as-built drawings highlighting any deviations from the original design. These drawings shall be verified and approved by the Owner.

11.7 Final Completion Report

At Project close-out, the Contractor shall prepare a comprehensive final completion report summarizing all construction activities, quality assurance and control results, HSE compliance, any deviations encountered and rectified, and confirmation that all works were completed in accordance with contractual requirements.

GE-CNG-PRO-CO-SOW-004 Rev 2 Construction Of Duct Banks, Pull pits, And Pedestals For Electrical Infrastructure

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