

PART 2:

Section VII - Employers Requirements

A. Scope of Supply of Plant and Installation Services by the Contractor

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1. GENERAL

1.1. Definitions

In addition to the terms referred to in PART 3, Section VII, the General Conditions of Contract, the following, where used in this Specification, shall have the meanings listed below: -

“Specified” shall mean specified herein or in the Schedules of Technical Information.

The present clauses refer to the general technical requirements for EPC (engineering – procurement – construction) contracts for electrical overhead lines.

The following directions, information and technical requirements for design, engineering, layout, manufacturing, erection, installation and testing shall be observed as far as they are applicable for the material and equipment to be delivered. The requirements stated in this Section of Technical Requirements are valid for all sections of the technical requirements, except where different, additional and/or special requirements are specified within the Guaranteed Technical Particulars (GTP).

Any changes on the design of any part of the Plant, which may become necessary after signing of the Contract, have to be submitted by the Contractor in writing to the Employer for approval, being sufficiently substantiated and justified.

The Plant shall be brand new and designed, manufactured and arranged so that it will have a functional design and a pleasant appearance.

The word “specified” shall mean specified herein or in the Technical Schedules.

1.2. Scope of Work

The scope comprises of design, manufacture, supply, testing, packing, transport, insurance, demurrage, delivery to and off-loading at site, storage, erection, installation, site testing, commissioning, training of KETRACO personnel, warranty and maintenance of the 132 kV Kabarnet-Rumuruti Transmission Line and other work incidental thereto included in the Specification.

1.3. Scope of Works for Transmission Lines

The contract outlines the construction of transmission lines projects as detailed here below:

- Approximately 94km, 132 kV 3-Phase double circuit transmission line from Kabarnet 132/33 kV substation to Rumuruti 132/33 kV substation on steel lattice towers.
- Dismantling, relocation and assembly of 132kV Lessos-Kabarnet line terminal tower from the current position to the new gantry position.
- Temporary bypass on Emergency Restoration System (ERS) towers that shall be procured, supplied and installed, to ensure continuity of power supply between Lessos and Kabarnet substations. The ERS towers will be recovered and handed over to KETRACO after successful completion of termination works for Rumuruti-Kabarnet and Lessos-Kabarnet transmission lines.

1.4. Extent of Work

The contract Works to be supplied shall include all work incidental thereto whether specified in detail or not and shall be carried out by the Contractor in accordance with the Specification and Conditions of Contract and shall comprise the following.

1.4.1. Definite Work

The supply and services to be performed by the Contractor shall comprise of the design, manufacture, supply, testing, packing, transport, insurance, demurrage, delivery to and off-loading at site, storage, erection, installation, site testing, commissioning, training of KETRACO personnel, warranty and maintenance of the following plant and materials and of the other work incidental thereto included in the Specification.

- a. The three-phase overhead transmission lines having the technical particulars set out in the Technical Schedules and Drawings attached to the Specification, the lines being complete with the survey, route clearance, line conductors, earth conductors, OPGW, underground optic fibre (if required), insulators and fittings, towers and foundations, earthing and connections, and all other fittings at the total price for the estimated quantities stated under the Price Schedules. Estimated quantities are for bid purposes only; final payment shall be made on the basis of quantities as finally erected and confirmed by measurement.

The transmission line works include the following but not limited to;

- Preliminary Survey, Alignment Survey, Detailed Survey and Check Survey
- Right-of-Way clearing and access roads
- Plan and profile production
- Preparation of all schedules (listed under submittals)
- Sag tension calculations and Tower spotting
- Geotechnical investigation
- Testing of Construction Materials and concrete mix

- Design, fabrication, type testing, assembly of towers, body extensions and leg extensions at works, shop drawings, bill of material, supply and erection of towers. Intellectual Property rights for the design and drawings shall be transferred to KETRACO after design approval.
- Design, supply, erection of tower signs and accessories.
- Design, supply and installation of conductor and line accessories.
- Supply and installation of Optical fibre ground wire (OPGW) and their accessories including joint boxes and termination boxes, etc.
- Testing of OPGW and provision of the OTDR test results.
- End to end testing for the complete fiber link
- Calculation of the OHL line parameters for System Protection.
- Design, supply of material and installation of foundations.
- Design, supply of material and installation of underground fiber optic cable and accessories including joint boxes and termination boxes, etc.
- Design, supply of insulator and hardware sets and installation of insulator strings.
- Design, supply and installation of transmission line tower grounding.
- Supply of spare parts and maintenance tools
- Dismantling surplus part of existing lines (and packing and transferring to the client's store/specified location as per client requirements)
- Re-tensioning part of existing lines in order to connect the new lines to the existing ones.
- Deployment of ERS towers for a temporary transmission line section.
- Final inspection, testing and commissioning, reinstatement and clean-up of site.
- Maintenance of the line until the completion of the defects liability period.
- As built drawings and electronic records.

The foregoing is indicative and by no means limiting; it is understood that the object of the contract is the handing over of the line completely finished to the minutest detail, in workmanlike manner, in full operational state, providing desired service, all necessary work and supply being at the Contractor's charge.

- b. Work at Time and Material rates: Only applicable If and when required to do so by the written instructions of the Employer/Employer's Representative any work not covered by the Price Schedules, at prices stated in Labour and Equipment Rates for Extra Field Work. – It is not relevant in this contract.

1.4.2. Terminal points

The downloads connections of conductors and earth wire, from the transmission line terminal towers to the substations gantry structures including any tension insulator as well as jumpers or droppers (if any) required to connect to the substation equipment are included in this Specification.

OPGW downloads will be terminated in a junction box to be mounted on the substation gantries.

The programme for work and work at all the terminal points are required to be coordinated with other contractors/ parties at no additional cost to KETRACO.

1.4.3. Details of transmission line routes

The proposed 132 kV line links the existing 132/33 kV substation at Kabarnet with the existing 132/33 kV substation at Rumuruti. The coordinates of the angle points of the route are provided below in UTM, ARC 1960.

COORDINATES DATUM: UTM ARC 1960				
NAME	ZONE	EASTING	NORTHING	REMARK
KABARNET SS	36N	807966.369	52995.560	Gantry point
TT	36N	139968.572	52994.324	Terminal new
AP25	36N	807940.614	52930.414	
AP24	36N	808040.826	52954.638	
AP23	36N	808147.567	52905.951	
AP22	36N	808575.334	53048.235	
AP21	36N	808796.201	53058.794	
AP20	36N	810236.425	52730.599	
AP19	36N	812000.865	52461.608	
AP18	36N	816103.500	53136.997	
AP17	36N	817826.164	51928.222	Airfield
AP16B	36N	153335.431	52340.381	
AP16A	36N	156860.598	53821.129	
AP16	36N	826211.648	52913.481	Airfield
AP15	36N	831079.984	51013.833	
AP14	37N	168500.907	50005.158	
AP13	37N	172595.739	49460.961	
AP12	37N	180554.048	49470.480	Escarpment
AP11	37N	187487.428	47837.773	Escarpment
AP10	37N	191467.578	40444.986	Escarpment
AP9	37N	193962.136	37918.984	
AP8	37N	198043.834	32566.053	
AP7	37N	198469.074	32291.257	
AP6	37N	199294.400	30506.549	
AP5	37N	201116.124	29676.299	
AP4	37N	203105.383	29711.573	
AP3	37N	207115.382	28843.955	
AP2	37N	211535.189	27202.527	
AP1D	37N	213922.832	27204.506	

COORDINATES DATUM: UTM ARC 1960				
NAME	ZONE	EASTING	NORTHING	REMARK
AP1C	37N	214535.089	27148.469	
AP1B	37N	216344.093	27205.099	
AP1A	37N	220825.655	27214.670	
AP1	37N	222009.452	27648.156	
TT	37N	222285.917	27485.349	Terminal
RUMURUTI SS	37N	222296.687	27469.522	Gantry point

1.4.4. Climate Data

1.4.4.1. Climate

Equipment design shall be based on the following conditions:

1.4.4.2. Rainfall

The annual rainfall is approximately 1500 mm for the area.

1.4.4.3. Temperatures

Minimum temperature	1° C
Maximum temperature	40°C
Max. Conductor temperature	80°C
Annual average temperature (Everyday temperature)	25° C

1.4.4.4. Humidity

Mean relative humidity (max/average)	92% / 68%
Relative humidity	78%

1.4.4.5. Isokeraunic Level

An isokeraunic level (storm) of 183 days/year shall be considered for design purposes.

1.4.4.6. Maximum Solar Radiation

For design purposes a solar radiation value of 1183W/m² shall be considered.

1.4.4.7. Earthquake loading

For design purposes an earthquake loading of 0.25g shall be assumed.

1.4.4.8. Wind load

For design purposes a basic wind velocity of 45m/s (gust wind 3 seconds) shall be assumed

1.4.4.9. Altitude

The height above sea level shall be considered as 2210 m.

1.4.4.10. Pollution

External insulation shall be designed to Pollution Level V (Very Heavy) in accordance with IEC60815-1.

The site specific weather/service conditions shall be provided during detailed design.

It is the contractor's responsibility to confirm detailed site specific weather/service conditions during bidding.

1.5. Units of measurement

The Contract shall be conducted in the SI (Système International d'Unités) system of units in accordance with the provisions of ISO 31 and ISO 1000.

In all correspondence, technical schedules, drawings and instrument scales, the following units or multiples thereof shall be used:

Table 1:Units

Quantity	Name of Unit	Symbol
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Temperature	Degree Celsius	°C
Temperature Difference	Kelvin	K
Electric Current	Ampere	A
Luminous Intensity	Candela	cd
Area	Square meter	m ²
Volume	Cubic meter Litre	m ³ l
Force	Newton	N
Pressure (absolute)	Bar Kilopascal	bar kPa
Pressure below 1 bar	Millibar	mbar
Stress	Newton per square millimeter	N/mm ²
Velocity	Meter per second	m/s
Rotational speed	Revolutions per minute	rpm
Flow	Cubic meter per day Cubic meter per hour Kilogram per hour Liter per second metric ton per hour	m ³ /d m ³ /h kg/h l/s t/h
	For gaseous substance: standard cubic meter per hour (referred to 0°C and 1013 mbar)	Nm ³ /h

Quantity	Name of Unit	Symbol
Density	Kilogram per cubic meter	kg/m ³
	Kilogram per standard cubic meter	Kg/Nm ³
Torque, moment of force	Newton meter	Nm
Moment of inertia (mr ²)	Kilogram square meter	kgm ²
Work, energy or heat	Joule	J
Heat capacity, entropy	Joule per Kelvin	J/K
Calorific value	Joule per cubic meter Joule per gram	J/m ³ J/g
Power, radiant flux	Watt	W
Heat release rate	Watt per square meter	W/m ²
Thermal conductivity	Watt per meter Kelvin	W/mK
Dynamic viscosity	Newton second per square meter	Ns/m ²
Kinematic viscosity	Meter squared per second	m ² /s
Surface tension	Newton per meter	N/m
Concentration	Parts per million	ppm
Electrical conductivity	Microsiemens per meter at 25°C	μS/m
Frequency	Hertz	Hz
Electric charge	Coulomb	C
Electric potential	Volt	V
Electric field strength	Volt per meter	V/m
Electric capacitance	Farad	F
Electric resistance	Ohm	Ω
Conductance	Siemens	S
Magnetic flux	Weber	Wb
Magnetic flux density	Tesla	T
Magnetic field strength	Ampere per meter	A/m
Luminous flux	Lumen	lm
Illuminance	Lux	lx
Thermal resistivity	Kelvin meter per Watt	Km/W
Energy	Kilowatt hour	kWh

1.6. Guaranteed values

The Contractor shall guarantee that the data mentioned on the name plate of the equipment and given in the data sheets will not deteriorate during the life of this equipment under the specified operating and maintenance conditions.

The Contractor shall guarantee the values in the technical data schedule. The Employer reserves the right to reject any equipment that does not respect these values.

1.7. Standards and codes

The work is to be performed according to the most recent relevant codes, standards, accident prevention regulations and legal regulations.

Change of standard during execution of the contract has USD 500,000 penalty.

1.7.1. General

EN 50341-1 : “Overhead electrical lines exceeding AC 45kV, Part 1 - General requirements – Common specifications”

IEC 60038 : “IEC standard voltages”

IEC 60060 : “High voltage test techniques”

IEC 60270 : “High voltage test techniques – Partial discharge measurements”

1.7.2. Conductors

- EN 50182: “Conductors for overhead lines - round wire concentric lay stranded conductors”
- ASTM B 232/ B 232M: “Specification for concentric-lay-stranded aluminium conductors, coated-steel reinforced (ACSR)”
- EN 60889: “Hard-drawn aluminium wires for overhead line conductors”
- EN 50189: “Conductors for overhead lines - Zinc-coated steel wires”
- EN 50326: “Conductors for overhead lines - Characteristics of greases”
- EN 10244: “Steel wire and wire products - Non-ferrous metallic coatings on steel wire - Part 2: Zinc or zinc alloy coatings”
- IEC TR 61597 : “Overhead electrical conductors - Calculation methods for stranded bare conductors”

- IEC 60468: “Method of measurement of resistivity of metallic materials”
- ISO 7802: “Metallic material - Wire - Wrapping test
- IEC 60104: Aluminium-Magnesium-Silicon Alloy Wire for Overhead Line Conductors
- IEC 60888: Zinc-Coated Steel Wires for Stranded Conductors
- IEC 60889: Hard-Drawn Aluminium Wire for Overhead Lines
- IEC 61089: Round Wire Concentric Laid Overhead Electrical Stranded Conductors
- IEC 61232: Aluminium-Clad steel Wires for Electrical Purposes
- IEC 61395: Overhead Electrical Conductors – Creep Test Procedures for Stranded Conductors
- IEC 62219: Overhead Electrical Conductors – Formed Wire, Concentric Lay, Stranded Conductors
- IEC 61284: Overhead Lines – requirements and Tests for Fittings
- IEC 60121 Recommendation for commercial annealed aluminum electrical conductor wire
- ASTM B415 Standard specification for hard-drawn aluminum-clad steel wire
- ASTM B416 Concentric-lay-standard aluminum-clad steel conductor
- ASTM B502 Standard specification for aluminum-clad steel core wire for aluminum conductors, aluminum-clad steel reinforced
- ASTM B193 Standard test method for resistivity of electrical conductor materials

1.7.3. OPGW

- ITU-T G.655: “Transmission media characteristics – Optical fiber cables - Characteristics of a non-zero dispersion shifted single mode optical fiber cable”
- IEC 60304: Standard Colours for Identification and Coding
- IEC 60793: Optical Fibres. Measurement Methods and Test Procedures
- IEC 60794: Optical Fibre Cables. Specifications
- ITU-T G.650.1: Definitions and test methods for linear, deterministic attributes of single-mode and cable.
- ITU-TG.650.2: Definitions and test methods for statistical and non-linear related attributes of single mode fibre and cable.

- IEEE 1138, 1994 Standard for construction of composite fibre optic overhead ground wire (OPGW) for use on Electric utility power line
- IEEE 812, 1984 Standard for Fibre Optics, Definition of Terms

1.7.4. Insulators/ Insulator Strings

- IEC 60071-1 : “Insulation co-ordination - Part 1: Definitions, principles and rules”
- IEC 60071-2 : “Insulation co-ordination - Part 2: Application guide”
- IEC 60815 : “Guide for the selection of insulators in respect of polluted conditions”
- IEC 61109 : “Composite insulators for AC overhead lines with nominal voltage greater than 1000 V – definitions, test methods and acceptance criteria”
- IEC 61466-1 : “Composite string insulator units for overhead lines with nominal voltage greater than 1000 V – Part 1: Standard strength classes and end fittings”
- IEC 61466-2 : “Composite string insulator units for overhead lines with nominal voltage greater than 1000 V – Part 2: Dimensions and electrical characteristics”
- IEC 60120 : “Dimensions of ball and socket couplings of string insulator units”
- IEC 60372 : “Locking devices for ball and socket couplings of string insulator units: Dimensions and tests”
- IEC 60437: “Radio interference test on high-voltage insulators”
- IEC 60507: “Artificial pollution tests on high-voltage insulators to be used on A.C. systems”
- IEC 61 467: “Insulators for OHL >1kV - Power Arc Tests for Insulator Sets”
- IEC 62217 - Polymeric insulators for indoor and outdoor use with a normal voltage > 1000V - general definitions, test methods and acceptance criteria
- ANSI C29.12 - For insulators composite - Suspension Type

1.7.5. Fittings

- IEC 61284 : “Overhead Lines - Requirements and tests for fittings”
- IEC 61854: “Overhead Lines - Requirements and Tests for Spacers”
- IEC 61897: “Overhead Lines - Requirements and Tests Stockbrigde Type Aeolian Vibration Dampers”

1.7.6. Towers

- EN 1993-1-1: “Design of steel structures - Part 1-1: General rules and rules for buildings”
- EN 1993-1-8: “Design of steel structures - Part 1-8: Design of joints”
- EN 10025 (2004): “Hot rolled products of structural steels”
- EN 10029: “Hot rolled steel plates 3mm thick and above”
- EN 10056: “Structural steel equal and unequal leg angles - Part 1: Dimensions, Part 2: Tolerances”
- ISO 898 : “Mechanical properties of fasteners”
- ISO 1461 : “Hot dip galvanized coatings on fabricated iron and steel articles”
- IEC 60652 : “Loading tests on overhead line structures”
- Paper 3B from IEE “Effects of Interacting Construction Deviations on 500 kV Power Line Structures” by F. Villa, Kuala Lumpur, Malaysia 1993.
- ISO 630: Structural Steels - plates, wide flats, bars, sections and profiles
- ISO 657: Hot rolled Structural Steel Sections, Part 5: Equal-leg angles and unequal-leg angles
- ISO 7452: Hot rolled structural steel plates tolerances on dimensions and shape
- ISO 7411: Hexagon Bolts for high strength structural bolting with large width across flats
- ISO 1459: Metallic coatings - Protection against corrosion by Hot Dip Galvanizing.
- ASCE 10-97: Design of latticed steel transmission structures.
- IEC 60826: Design criteria of overhead transmission lines

1.7.7. Foundations

- EN 1997-1-1: “Geotechnical design - Part 1: General rules”
- EN 197-1 : “Cement – Composition, specification and conformity criteria”
- BS EN 12620: “Specification for aggregates from natural sources of concrete”
- EN 206-1 : “Concrete – Specification, performance, production and conformity”
- EN 10080: “Steel for the reinforcement of concrete - Weldable reinforcing steel - General”

- EN 1992-1: “Design of concrete structures - Part 1-1: General rules and rules for buildings”
- EN 12350-1: “Testing fresh concrete”
- EN 12390-3: “Testing hardened concrete”
- IEC 61773: “Overhead lines – Testing of foundations for structures”.
- BS 8004: Code of Practice for Foundations.
- BS EN 1992-1-1:2023: Eurocode 2. Design of concrete structures - General rules and rules for buildings, bridges and civil engineering structures.
- BS 4449: Steel for the reinforcement of concrete. Weldable reinforcing steel. Bar, coil and decoiled product. Specification

All materials and equipment supplied and all work carried out as well as calculation sheets, drawings, quality and class of goods, methods of inspection, constructional peculiarities of equipment and parts and acceptance of partial plants, as far as these are beyond the special requirements of partial plants and as far as they are beyond the particular requirements of the technical requirements shall comply in every respect with the technical codes of the International Organization for Standardization (ISO). IEC recommendations apply to the electrical equipment.

The type and extent of inspection shall generally be in accordance with that specified in the standard used for design and construction of the item of equipment supplemented or amended by the requirements of this section of the technical requirements.

Additional design tests are also to be carried out as described in the other parts of this technical requirements.

Reference to special codes and standards, where designated either directly or as "relevant", is intended to provide a measure of performance, safety, in-shop and on-site testing, and methods of construction and/or installation which must be equal or exceeded in order to be considered acceptable for use under these technical requirements. If more than a single degree of quality or accuracy is permitted within the scope of particular code or standard, the highest quality shall be applicable and the degree of accuracy commensurate with the intended function shall be selected but with the understanding in either case that the decision as to degree will be made finally along with procedures by the Employer / Employer's Representative.

In all instances, the finally accepted applicable code or standard shall be the version last published prior to the date of submission of the Bid selected as the basis for this Contract.

Where no appropriate standard is available, tests shall be carried out in accordance with the manufacturer's standard practice, which needs the approval of the Employer / Employer's Representative. In such cases the Contractor shall submit to the Employer / Employer's Representative complete data and a suggested procedure for the testing to be performed before manufacture commences. If the proposed procedure is accepted, the Contractor shall provide the Employer / Employer's Representative with four additional copies in English before any test is performed.

The Contractor's attention is drawn to the climatic conditions in the site area. De-rating factors are to be in accordance with the relevant IEC codes and standards or an approved equivalent.

Goods and special guarantees beyond the scope of ISO and IEC shall conform at least to the following standards and codes in the following priority:

EN, BS, ASTM, IEEE;

Contractor, subcontractors, sub-suppliers and shops are to be certified according to ISO 9001:2015.

In case of differences between the specification and relevant standard the more stringent condition shall be applied.

1.8. Plant and equipment identification

The Contractor shall apply a plant identification system showing the name and number of each item of plant and its respective arrangement drawing number and add any additional items necessary to fully identify the plant. There is to be only one description for any one item of plant and this must be used consistently for plant, electrical and instrumentation designations throughout.

IEC-Publication 61346-1 shall be applied.

The classification numbers shall appear in all drawings, lists, documents prepared by the Contractor for the project right from the initial stage of the contract execution.

The Contractor shall supply all labels, nameplates, instruction and warning plates necessary for the identification and safe operation of the plant. Their inscriptions shall be in the national language of the Employer's country if not otherwise mentioned.

All labels, nameplates, instruction and warning plates shall be securely fixed to items of plant and equipment with stainless steel rivets, plated self-tapping screws or other approved means. The use of adhesives will not be permitted.

Nameplates for plant and equipment identification and record purposes shall be manufactured from stainless steel with a matte or satin finish, and engraved with black lettering of a size which is legible from the working position.

Warning plates shall be manufactured from stainless steel engraved with white lettering on a red background and sited in the position where they afford maximum safety of personnel, these shall conform to KETRACO safety rules

All equipment within panels and desks shall be individually identified by satin or matte finish stainless steel labels, or laminated plastic labels where approved.

1.9. Transport and storage of material

The Contractor shall inform himself fully as to all available transport facilities, road width, and axle load limitations, loading gauges and any other requirements and shall ensure that

equipment as packed for transport shall conform to the relevant limitations. Any cost arising from the use of roads or tracks, including tolls, shall be borne by the Contractor.

The Contractor shall ensure by his own enquiries that the facilities available for unloading and bearing capacity of wharfs at ports are adequate for his proposed plant and equipment.

The Contractor shall take reasonable steps to prevent any highways or bridges from being damaged by his traffic and shall select routes, choose and use vehicles and restrict and distribute load so that the risk of damage shall be limited as far as is reasonably possible. The Contractor shall immediately report to the Employer's representative any claims made against him arising out of alleged damage to a highway or bridge.

The Contractor shall be responsible for all costs including those incurred by KETRACO, arising from repair or replacement due to damage to equipment or materials during transport, off-loading or erection on site, until take-over by KETRACO.

The Contractor shall be responsible for obtaining from the relevant authorities all permissions necessary to use docking, off-loading, highway, and bridge facilities required for the transportation of contract materials and plant.

All transport costs including road widening or bridge strengthening are deemed to be included in the contract price.

Shipment by sea freight shall be made to the designated port of destination. Airfreight shall be made to the destination airport, as agreed with the Employer.

Shipments are to be made on a „CIP “basis according to Incoterms and explained in the commercial conditions.

Prior to shipment the Contractor shall furnish by air mail, or otherwise, as agreed the shipping documents to the Employer. Details will be fixed during the Kick-Off Meeting.

All cases and boxes shall be clearly and boldly marked and shall be sent to the Employer as per address details instructed by the Employer. When the actual transport has been completed, the Employer shall be notified accordingly.

In order to facilitate custom examination, all packages and transport documents shall regardless of other markings be clearly and indelibly marked.

It is the Contractors' responsibility to ensure that the packing and handling is made in such a way that neither the steel nor the galvanizing shall be damaged in transit and storing. Transporting vehicles shall be clean and free from foreign material which could in any way injure the steel or zinc coating and painting. All necessary measures shall be taken to prevent structural deformation to members, or damage to galvanized or painted coatings. Members shall not be dragged on the ground, or will the practice of throwing tower steel into piles on conveyances, or from conveyances onto the ground, and of skidding steel members over each other, be permitted.

The Contractor shall ensure that adequate handling equipment is available to unload the heaviest piece of equipment. Tower material damaged shall be replaced by the Contractor at no cost to the Employer. Small accidental damages to galvanized surfaces may be repaired by

application of approved repair paint subject to approval from the client. Larger damages to, or systematic defects of the galvanizing shall be repaired by hot-dip galvanizing only.

The attempt to repair shall not bind the Employer to accept the repaired part when this is re-offered for inspection. Acceptance by the Employer of any repaired galvanized steel does not release the Contractor from his responsibility of supplying galvanized steel to give satisfactory service in the prevailing corrosive atmosphere. The Employer reserves the right to reject any galvanized steel found rusty, damaged, bent or other-wise defective, before final acceptance.

Steel shall be stored on wooden supports of sufficient height, to avoid any ground contact or other contamination. Storage conditions shall be well ventilated, preventing the formation of wet storage stain from accumulation of humidity and sand. It shall be clearly understood, that white rust formation will lead to rejection of the affected material.

1.10. Signs

Safety colours, safety symbols and safety signs must comply in construction, geometrical form, colour and meaning with the ISO 7010 and ISO 3864.

Signs for plant identification during the erection period shall be to Employer's approval.

The signs should be of a material which is weather-resistant and of sufficient durability for the conditions prevailing on site.

1.10.1. Mounting and installation

The positions for the signs shall be chosen so that they are within the field of vision of the persons to whom they apply. The signs should be permanently attached. Temporarily dangerous areas (e.g. construction sites, assembly areas) may also be marked by movable signs. The safety signs must be mounted or installed in such a manner that there is no possibility of misunderstanding.

1.10.2. Warning signs

Warning signs should refer to the existence or possible existence of danger, e.g., general danger, high voltage and climbing prohibited.

In addition to warning signs, appropriate black-yellow strip markings should also be used where necessary.

1.11. Pre-service cleaning and protection of plant

This clause covers mechanical and pre-service cleaning and protection of the plant items and equipment at the Manufacturer's workshop and at site that are not subsequently to be painted.

Cleaning of fabricated component items shall be carried out after fabrication and final heat treatment or welding at manufacturers' works or at site, as appropriate.

In the event of the surfaces not being cleaned to the Employer's satisfaction, such parts of the cleaning procedures or agreed alternatives as are deemed necessary to overcome the deficiencies shall be carried out at the Contractor's sole expense.

Mechanical cleaning as opposed to alternative chemical cleaning is the preferred method for workshop cleaning except where this is precluded by design or access considerations.

Machined surfaces shall be protected during the cleaning operations. For re-cleaning small areas, hand cleaning by wire brushing may be permitted. Wire brushes used on austenitic materials shall have austenitic steel bristles.

Austenitic stainless steels, copper and aluminium alloys, cast iron, bimetallic and metallic/plastic items, and components fabricated by spot welding or riveting shall not be chemically cleaned. All weld areas shall be suitably stress-relieved before chemical cleaning.

All necessary equipment, provisions, chemicals etc. are to be provided by the Contractor.

Besides this, the Contractor shall take over all responsibility for the treatment and disposal of wastes according to the local law and to the satisfaction of the Employer.

The Contractor shall take all necessary precautions to ensure that the internal surfaces of all plant are kept clean and free from injurious matter during erection.

1.12. Health, Safety and Security

1.12.1. Safety of Personnel

The maximum safety, consistent with good erection practice, must be afforded to personnel directly engaged on this Contract, or who in the normal course of their occupation find it necessary to utilize temporary works erected by the Contractor or frequent the working area. Reasonable measures shall be taken to afford adequate protection against material falling from a higher level onto personnel below.

The Contractor and his representatives shall always comply with KETRACO's Employer's Safety Rules regarding electrical apparatus and the safety of men working thereon.

Particular care shall be taken during work at places where the line runs parallel to other lines that may be energized.

No testing or other work on apparatus which has been delivered to Site and which is liable to be electrically charged from any source shall be permitted except under a "Permit to Work" which will be issued for the purpose by KETRACO's Operating Employer's representative.

At the completion of the Contract Works the Employer's representative shall undertake an inspection to ensure the operational safety of the overhead electricity transmission lines. For this purpose, the Contractor shall jointly undertake with the Employer's representative and KETRACO an inspection of the Contract Works. The cost of any re-inspection occasioned by non-compliance with the Specification by the Contractor shall be borne by the Contractor.

Prior to construction work commencing, the Contractor shall provide a Health and Safety Plan, incorporating the Environmental, Health and Safety Management plan, for review by the Employer's representative. This Plan shall cover all activities related to the execution of the Project.

1.12.2. Security measures

The Contractor shall implement a program for security of his personnel in accordance to safety regulation applicable in Kenya.

The Contractor shall designate an officer in charge of security that has the training and the equipment to attend emergency situation. This officer will have the authority to stop the work at any time, if he judges that security of personnel is compromised or the method or equipment or machinery employed to perform the work is not convenient, and expel any individual that does not comply with safety rules.

1.12.2.1. Security Plan

The Contractor shall present a security plan for the Employer's representative's review and acceptance. The plan shall cover essentially the following aspects:

- Name of security officer and proof of adequate training;
- Safety rules for Contractor personnel and visitors;
- Means for fast transportation of injured personnel;
- Hygiene on site of works (Potable water supply, closets,...);
- Security against environmental conditions, animals and burglars;
- Security against electrical shock;
- First aid measures on site;
- Accessibility to nearby hospital and clinic at any time with arrangement for standby medical personnel;
- Supply to personnel of security hats, boots and glasses by Contractor at his own expenses.
- Supply to visitors at site ,reflectors and helmets

1.12.2.2. Prevention of Accidents

All Contractor personnel shall be properly identified to control their access to the site of works. Unauthorized person shall be prevented from entering the premises. Identification shall also be shown to the Employer's representative and his representatives for inspection of the works.

As a matter of example, the following measures shall be implemented:

- There shall be at least two out of every 10 workers that is trained for first aid and have readily available a suitable first aid kit;
- Any worker responsible for manoeuvring electrical equipment used for the work shall be trained to cut power and attend any worker that has been electrocuted;
- Equipment of 40 kg or more shall be handled by a minimum of two workers. Otherwise, crane or hoist shall be used;
- All tools shall be provided with hard wood handle with no loose part or cutting edges;
- Cutting tools shall come with proper handle length, security lock and storing case;
- Wrenches shall have a lever of convenient length to avoid the use of external tube extension;
- Handling of conductors or metallic cables close to energized lines or substation bus shall be prohibited;
- Work shall be performed by a minimum of two workers;
- Metallic ladders shall be preferably used.
- The contractor shall secure all open excavations against unauthorized access by persons and animals.

1.12.2.3. **Work in Energized Area**

When the work is in a place where the workers will access energized area, the Contractor shall present to the Employer's representative, a detailed work plan where the Contractor explains the method he will be using to perform each operation. The Employer's representative will coordinate to obtain the permit for the to access the area and, when necessary, to put the corresponding section out of service. Work on energized part is prohibited, unless approved by the client.

The Contractor will be responsible to implement safety measures for work in energized surrounding involving use of padlocks, temporary fences, signs, grounding tools, colored tape to limit the zone etc.

These measures shall be agreed with the Employer's representative and the operator of the substation.

The main aspects to be considered are:

- Procedure for applying safety rules:
 - Identification of electrical zone isolating points

- Request for removing an equipment from service
- Setting equipment out of service (padlocks, signs, grounding)
- Work permit
- Definition of work safe zone (Planning of safety measures, identification of dangerous points, application of safety measures...)
- Limit of work safe zone
- Instruction to personnel
- Presence of person in charge of works
- Interrupting the works
- Test
- End of work and leaving work zone
- Take away of the protected zone
- End of work advice
- Work ruling (authorization, self-protection, agreement, holding by operator...)
- Training of personnel
- Control of safety equipment

1.13. Compliance with regulations

All apparatus and materials supplied and all work carried out shall comply in all respects with such of the requirements of the Regulations and Acts in force in the State of KENYA as are applicable to the Contract Works and with other applicable Regulations to which KETRACO is subject.

1.14. General particulars and guarantees

The Works shall comply with the general particulars and guarantees stated in the Technical Schedules.

All working methods employed and all plant and apparatus supplied under this Contract shall be to approval.

The Contractor shall be responsible for any discrepancies, errors or omissions in the particulars and guarantees, whether the Employer's representative has approved such particulars and guarantees or not.

1.15. Compliance with standard specifications

Except where otherwise specified or implied, the works shall comply with the latest applicable Standards or Recommendations of the International Electro Technical Commission (IEC), Institute of Electrical and Electronics Engineers (IEEE) or to the standards of the Euro code/British Standards Institution (the said Specifications being hereinafter referred to as EN/BS), prior to the closing date of the bid.

Where other standards are proposed in place of IEC, IEEE or EN/BS standards confirmation shall be provided that the provisions of the standards are equivalent to or exceed those of equivalent IEC, IEEE or EN/BS standards.

Copies of any standards proposed in substitution for IEC, IEEE Standards or Recommendations or British Standards must be submitted with the Bid accompanied where necessary by English translations of the appropriate sections.

No departures from the Specification are to be made without the written approval of the Employer's representative .

1.16. Variations from Conditions of Contract

In the event of there being any inconsistency between the provisions of this Technical Specification and the Conditions of Contract, the provisions of the Conditions of Contract shall prevail and shall be considered as incorporated in the Contract.

1.17. Subcontracted plant, materials and labour

The Contractor shall also provide the Employer's representative with names and details of local subcontractors including design office from the list of evaluated and approved subcontractors before such subcontracts are placed. KETRACO reserves the right to withdraw its consent to local subcontract arrangements if such are considered unsuitable, but consent will not be unreasonably withheld.

Subcontractors/manufacturers for major items of supply or services identified in the prequalification document must meet or continue to meet the minimum criteria specified therein for each item.

1.18. Access to manufacturers' works

Access to the Contractor's and Subcontractors' works shall be granted to the representatives of the Employer's representative and of KETRACO for the purpose of inspection, testing and ascertaining progress.

1.19. Planning, progress reports and project progress meetings

The Contractor shall submit for review, based on contract time schedule, an outline design, manufacture, delivery and construction and erection chart. In addition, the Contractor shall provide a detailed programme in a format to be agreed by the Employer's representative ; this programme shall also include details of drawing submissions. The detailed programme shall cover all aspects of the Contract: design, procurement, manufacture, testing, shipment and transport, delivery to site, all site operations related to construction, erection and installation, testing at site, commissioning and completion of the works.

The Contractor shall submit to the Employer's representative at monthly intervals, not later than the twenty fifth day of the current month, and in such formats as may be required by the Employer's representative, detailed progress reports of the status of design, material procurement, manufacture, works tests, delivery to Site, erection of all plant and materials included in the Contract, testing and commissioning with regard to the agreed contract programme.

The details on material procurement shall give the dates and details of orders placed, indicating delivery dates and expected inspection dates quoted by the manufacturer. If any delivery date has an adverse effect on the contract programme the Contractor shall state the remedial action taken to ensure that delays do not occur.

The section on manufacture shall indicate dates of arrival of material, the progress of manufacture and testing and shall state the date on which the material will be ready for transport. Any events which may adversely affect completion in the manufacturer's works shall also be reported.

All works tests and the test results shall be listed and a commentary provided. Any test failures shall be explained and the Contractor shall state his proposed actions to prevent delay to the project completion.

The shipping or transport of each order shall be monitored in the progress report and shall give the date when equipment is available for transport, the expected time of delivery to site and the dates actually achieved.

The report on the site works shall be subdivided into each of the activities included in the detailed construction programme and each activity shall be monitored giving work achieved, the percentage completion and estimated completion dates for each activity, in accordance with the contract programme. The number of men working on site, both labour and supervisory staff, shall be reported together with any incidents or events that may affect the progress of site works. The progress reports shall include photographs of work items of interest and any unusual form of construction or foundation work.

A site weekly programme of work shall be provided each week during the previous week.

Any delays which may affect any milestone or completion date shall be detailed by the Contractor who shall state the action taken to effect contract completion in accordance with the contract programme.

The Contractor shall forward two copies of each progress report to the Employer's representative. If during the execution of the Contract the Employer's representative considers the progress position of any section of the work to be unsatisfactory the Employer's representative shall be at liberty to call progress meetings at site or in his office with a responsible representative of the Contractor.

Project progress meetings shall be held at monthly intervals or as mutually agreed between the Contractor and KETRACO. The venue for each project progress meeting (including necessary refreshments etc) is to be provided by the Contractor throughout the duration of the contract.

1.20. Quality assurance

To ensure that the supply and services under the Scope of this Contract, whether manufactured or performed within the Contractor's works or at his subcontractors' premises or at Site or at any other place of work are in accordance with the Specification, with the Regulations and with relevant authorized standards, the Contractor shall adopt suitable quality assurance programmes and procedures to ensure that all activities are being controlled as necessary.

The quality assurance arrangements shall conform to the relevant requirements of ISO 9001:2015.

The systems and procedures which the Contractor will use to ensure that the Works comply with the Contract requirements shall be defined in the Contractor's Quality Plan for the Works.

The Contractor shall operate systems that implement the following:

Hold point - "A stage in material procurement or workmanship process beyond which work shall not proceed without the documented agreement of designated individuals or organizations."

The Employer's representative's written agreement is required to authorize work to progress beyond the hold points indicated in reviewed quality plans.

Notification point – "A stage in material procurement or workmanship process for which advance notice of the activity is required to facilitate witness."

If the Employer's representative does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

1.20.1. Quality assurance requirements

The Contractor and subcontractors, shall, for all phases of work to be performed under the Contract, establish and implement quality assurance arrangements which, as a minimum, meet the requirements of ISO 9001:2015, "Quality Management Systems - Requirements".

The Contractor shall ensure that all work carried out under the Contract is performed by suitably qualified and skilled personnel and that good quality materials, which meet relevant international standard specifications, where such exist, are used.

1.20.2. Quality assurance arrangements – quality plan

The Contractor shall submit a comprehensive contract specific Quality Plan for review and comment, within two weeks of award of contract.

The Quality Plan shall identify as a minimum:

- a. the Contractor's organization and responsibilities of key management including quality assurance personnel;
- b. the duties and responsibilities assigned to staff ensuring quality of work for the Contract;
- c. the prime project documents, specifications, codes of practice, standards;
- d. the correspondence and reporting interfaces, and liaison between the Employer's representative and the Contractor;
- e. the procedures the Contractor intends to use to manage and control the Contract, including:
 - i. the duties and responsibilities assigned to staff ensuring quality of work for the Contract;
 - ii. hold and notification points;
 - iii. submission of engineering documents required by the Specification;
 - iv. the inspection of materials and components on receipt;
 - v. reference to the Contractor's work procedures appropriate to each activity;
 - vi. inspection during fabrication/construction;
 - vii. final inspection and test.

It is recommended that separate Quality Plans be submitted for the design/manufacture and construction/installation phases.

The Contractor shall review, amend and re-submit quality plans as necessary during the Contract.

1.20.3. Monitoring by the Employer's representative

During the course of the Contract the Employer's representative reserves the right to monitor the implementation of the Contractor's quality assurance arrangements.

The Contractor's compliance with equipment, documentation, drawing, delivery, construction, installation and commissioning schedules shall be monitored by the Employer's representative.

Monitoring may be by means of a programme of formal audits and/or surveillance of activities at the work locations. Where deficiencies requiring corrective actions are identified, the

Contractor shall implement an agreed corrective action programme. The Employer's representative shall be afforded unrestricted access at all reasonable times to review the implementation of such corrective actions.

For site work the Employer's representative may monitor all aspects of the Contractor's daily work including that of subcontractors and assess the achievement of milestones as detailed by schedule deliverables.

The Employer's representative reserves the right to monitor the subcontractors and the Contractor shall ensure that all subcontracts include, and subcontractors are aware of, this requirement.

1.20.4. Contractor quality audits

The Contractor shall carry out a formal programme of project quality audits. These shall include audits of the design, manufacture, assembly, erection, installation, test and commissioning functions of the Contractor's organization and those of its subcontractors and suppliers. The Employer's representative reserves the right to accompany the Contractor on such audits.

The Contractor shall formulate a 6-month project specific audit programme, covering 6-month periods, which shall be submitted to the Employer's representative for review within 4 weeks of the Commencement Date of the Contract and thereafter every 6 months. Any revision to the audit programme shall be forwarded to the Employer's representative .

1.20.5. Control of subcontractors

The Contractor shall be responsible for specifying the quality assurance requirements applicable to subcontractors and suppliers, for reviewing the implementation of subcontractors' quality assurance arrangements and for ensuring compliance with the requirements.

The Contractor shall ensure that all appropriate technical information is provided to subcontractors and suppliers. The Contractor shall, for the supply of items, plant or equipment (including those subcontracted), arrange for suitable protection for the product at all stages including delivery and installation at the site.

The Contractor shall submit, for information, a detailed programme defining the basis of control to be applied to each subcontract or supply order.

1.20.6. Inspection and tests

Inspection and test plans shall be prepared for all major items of equipment/plant, defining the quality control and inspection activities to be performed to ensure that the manufacture and completion of the plant complies with the specified requirements.

Inspection and test plans shall be submitted for review.

The Contractor shall submit for review, within 30 days of the contract effective date, a schedule defining the plant/equipment/systems/services that are to be subcontracted, identifying all items for which inspection and test plans will be submitted.

The Contractor shall review all inspection and test plans and associated control documents, of any subcontractors and suppliers, to ensure their adequacy prior to submission.

The Contractor shall be responsible for identifying and arranging any statutory verification activities in the country of manufacture.

Inspection and test plans may be of any form to suit the Contractor's system, but shall as a minimum:

- a. Indicate each inspection and test point and its relative location in the production cycle including incoming goods, packing and site inspections.
- b. Indicate where subcontract services will be employed (e.g. subcontractor NDT or heat treatment).
- c. Identify the characteristics to be inspected, examined, and tested at each point and specify procedures, acceptance criteria to be used and the applicable verifying document.
- d. Indicate mandatory hold points established by the Employer's representative that require verification of selected characteristics of an item of process before this work can proceed.
- e. Define or refer to sampling plans if proposed and where they will be used.
- f. Where applicable, specify where lots or batches will be used.

The Contractor shall include in all orders to subcontractors, a note advising that all materials and equipment may be subject to inspection by the Employer's representative as determined by the inspection and test plan. Copies of such purchase orders shall be forwarded to the Employer's representative .

In order to verify compliance with engineering, procurement, manufacturing requirements and programmes, the Employer's representative shall have access, at all times, to all places where materials or equipment are being prepared or manufactured, including the works of the Contractor's subcontractors or supplies of raw materials.

The Contractor shall advise the Employer's representative of the readiness of inspection at least 6 weeks prior to a nominated inspection/surveillance witness or hold point. Work shall not proceed beyond a hold point without the written agreement of the Employer's representative or his nominated representative.

Inspection of the plant/equipment may be made by the Employer's representative and could include the following activities:

- i. Periodic monitoring to confirm the effectiveness of, and the Contractor's compliance with, the established quality plan, system procedures and inspection and test plan.
- ii. Witnessing of inspections and tests and/or verification of inspection records to be carried out at the Employer's representative's discretion covering:
 - compliance of raw material with specified requirements

- compliance of manufactured parts, assemblies and final items with specifications, drawings, standards and good engineering practice
- witnessing of inspection and tests
- packing for shipment including check for completeness, handling requirements, and case markings and identification.

Raw materials, components, shop assemblies, and the installation thereof, shall be subject to inspection and test by the Employer's representative as required by the Specification and to the extent practicable at all times and places, during the period of manufacture.

The Contractor shall keep the Employer's representative informed in advance of the time of starting and of the progress of the work in its various stages so that arrangements can be made for inspection and for test. The Contractor shall also provide, without additional charge, all reasonable facilities and assistance for the safety and convenience of the Employer's representative in the performance of his duties. All of the required tests shall be made at the Contractor's expense, including the cost of all samples used.

The Contractor shall not offer, unless otherwise agreed, any item of equipment or system for inspection to the Employer's representative until all planned inspections and tests to date have been completed to the satisfaction of the Contractor.

The Employer's representative shall endeavour to schedule the performance of inspection and tests so as to avoid undue risk of delaying the work. In the event of postponement, by the Contractor, of tests previously scheduled, or the necessity to make additional test due to unsatisfactory results of the original tests, or other reasons attributable to the Contractor, the Contractor shall bear all costs for new tests and the costs incurred by the Employer's representative or his nominated representative in re-inspecting the non-conforming item or its replacement.

The inspection and tests by the Employer's representative of any equipment/component or lots thereof does not relieve the Contractor of any responsibility whatever regarding defects or other failures which may be found before the end of the defects liability period.

The Contractor shall provide a quality release certificate confirming compliance with the Contract requirements and a data book, comprising the inspection, test, qualification and material records required by the pertaining specifications.

No material shall be shipped to the Site or put to work until all tests, analysis and inspections have been made and certified copies of reports of test and analysis or Contractor's certificates have been accepted and released by the Employer's representative or by a waiver in writing.

1.20.7. Construction/installation phase

Within 30 days of mobilization of works, inspection and test plan(s), similar in form and content to that described in "Inspection and tests", shall be submitted defining relevant inspection and test points for all stages of construction/erection, installation and commissioning. The inspection and test plans shall identify activities for which method statements shall be prepared.

Method statements shall be submitted to the Employer's representative for review.

Programmes of site construction works shall be submitted to the Employer's representative , giving notification of forthcoming test/inspections on a weekly basis.

1.20.8. Non-conformances

All items or services not in accordance with the Contract technical specification, or deviating from a previously reviewed document, shall be considered non-conforming.

All such items shall be clearly identified and isolated where practical, and reported to the Employer's representative via a non-conformance report. Information to be provided with non-conformance notifications shall include:

- a. identification of the item(s);
- b. reference to relevant specification/drawings, including applicable revisions;
- c. reference to the application inspection and test plan stage;
- d. description of the non-conformance, with sketch where appropriate;
- e. method by which the non-conformance was detected;
- f. cause;
- g. proposed corrective action, with technical justification, where necessary;
- h. for significant non-conformances, proposed action to prevent recurrence;
- i. applicable procedures.

The Employer's representative shall have complete authority to accept or reject any equipment or part thereof considered not to be in accordance with the specified requirements.

Approval of any concession applications is the prerogative of the Employer's representative , and approval of a particular case shall not set a precedent.

Any non-conformances identified by the Employer's representative shall be notified by issue of the Employer's representative 's non-conformance report to the Contractor. Notification of re-inspection shall not be made until the completed non-conformance report, together with any applicable concession applications have been accepted by the Employer's representative .

Acceptance or rejection of the equipment and/or components will be made as promptly as practicable following any inspection or test involvement by the Employer's representative . However, failure to inspect and accept or reject equipment and/or components shall neither relieve the Contractor from responsibility for such items, which may not be in accordance with the specified requirements, nor impose liability for them on the Employer's representative .

1.20.9. Records

Records packages to be delivered shall be agreed with the Employer's representative prior to setting-to-work of each phase, i.e. design, manufacture, construction, installation and commissioning.

1.20.10. Method statements

Prior to commencing work, the Contractor shall submit method statements setting out full details of his methods of working. This is a hold point.

1.21. Design and standardization

Corresponding parts of all material shall be made to gauge and shall be interchangeable. When required by the Employer's representative the Contractor shall demonstrate this quality by actually interchanging parts. As far as possible all insulators, fittings and conductor joints and clamps should be interchangeable with the equivalent items of the existing transmission system, details of which are obtainable from the Employer's representative. All equipment performing similar functions shall be of the same type and manufacture, to limit the stock of spare parts required and maintain uniformity of plant and equipment to be installed.

The Employer reserves the right to ask for coordination of standardization to the extent reasonably possible, and no price variation will be allowed for this procedure.

The Works shall be designed to facilitate inspection, cleaning, maintenance and repair as well as hot line maintenance and simplicity of operation, inspection, cleaning and repairs, and for operation where continuity of supply is the first consideration. All apparatus shall also be designed to ensure satisfactory operation under the atmospheric conditions prevailing at the site, and under such sudden variations of load and voltage as may be met with under working conditions on the system, including those due to faulty synchronizing and short circuit.

The design shall incorporate every reasonable precaution and provision for the safety of all those concerned in the operation and maintenance of the Works and of associated works supplied under other contracts.

Note: The contractor shall have all Engineering plans, designs, surveys, schemes, proposals, reports, studies, calculations and drawings signed off by a Professional Engineer registered in Kenya before submitting to KETRACO for review and approval. This is a mandatory requirement by the most recent Engineers Act under Kenyan law.

The Engineer shall be a Registered Professional Engineer with Engineers Board of Kenya (EBK). In order to register with EBK as a Professional Engineer, one shall meet the following qualifications:

- Registered with EBK as a Graduate Engineer;
- Have at least 3 years working experience from the date of registration as a Graduate Engineer;
- Have worked under supervision of a Professional Engineer.

1.22. Quality of material

All materials shall be new and of the best quality and of the class suitable for working under the conditions, variations in temperature and pressure encountered in service without undue distortion or deterioration or the setting up of undue stresses in any part, such as not to affect the efficiency and reliability of the plant. No repair of defective parts including welding, filling and plugging will be permitted without the sanction in writing of the Employer's representative.

Either, all materials shall conform to the approved standards and the respective code number, or exact analysis data and full information concerning properties, chemical and mechanical treatment shall be submitted.

Only materials which have been tried and tested in similar plants shall be used. Steel castings shall not have any casting defects which could compromise the function of the component and affect the appearance. The materials employed shall serve their purpose, according to the operation conditions. The Contractor shall be responsible for selecting, working, treating and quality assurance of the materials to suit the intended purpose.

Special attention shall be paid to the corrosion by galvanic effects or electrochemical corrosion. Design, selection of material and its combination as well as methods of erection shall be such as to exclude these effects.

It is not permissible to use gray cast iron for components containing pressure, unless the Employer expressly agrees to this beforehand.

Asbestos or materials containing asbestos for seals, expansion joints, etc. shall not be employed.

Likewise, it is not permissible to use mercury or oils containing Polychlorinated Biphenyl (PCB).

No welding, fitting or plugging of defective parts will be permitted without permission in writing from the Employer.

1.23. Language, weights and measures

The English language shall be used in all written communications between KETRACO, the Employer's representative and the Contractor with respect to the services to be rendered and with respect to all documents and drawings procured or prepared by the Contractor pertaining to the work.

Whenever anything is required under the terms of the Contract to be marked, printed or engraved, the English language shall be used except where otherwise provided in the Specification.

The design features of all equipment, all quantities and values which are required to be stated in the Technical Schedules and all dimensions on drawings whether prepared by the Contractor or not shall be stated in the International System of Units (SI).

1.24. Testing and inspection

All materials used in the Contract Works shall be made available for inspection and test by the Employer's representative during manufacture and it is the Contractor's responsibility to advise KETRACO when equipment and materials are available for inspection.

The Contractor shall carry out the tests stated in the Tests section of this Technical Specification in accordance with the conditions thereof and the latest applicable Standards or Recommendations and such additional tests as in the opinion of the Employer's representative are necessary to determine that the Works comply with the conditions of this Specification either under test conditions (in the Manufacturer's Works, on the Site, or elsewhere), or in ordinary working. Type tests may be omitted at the discretion of the Employer's representative if satisfactory evidence is given of such tests already made on identical equipment.

All materials used shall also be subjected to and shall withstand satisfactorily such routine tests as are customary in the manufacture of the types of plant or material included in the Works.

All tests shall be carried out to the satisfaction of the Employer's representative and in his presence, at such reasonable times as he may require, unless agreed otherwise.

Not less than 6 weeks' notice of all tests shall be given to the Employer's representative in order that he may be represented if he so desires. As many tests as in the opinion of the Employer's representative are possible shall be arranged together.

The original and copies of test records whether or not they have been witnessed by the Employer's representative shall be supplied to the Employer's representative.

Measuring apparatus shall be approved by the Employer's representative and if required shall be calibrated at the expense of the Contractor at an approved laboratory.

The Contractor shall be responsible for the proper testing of work completed or plant or materials supplied by a sub-Contractor to the same extent as if the work, plant or materials were completed or supplied by the Contractor himself.

The Contractor shall supply suitable test pieces of all materials as required by the Employer's representative. If required by the Employer's representative test specimens shall be prepared for check testing and forwarded at the expense of the Contractor to an independent testing authority selected by the Employer's representative.

No inspection or passing by the Employer/Employer's representative of work, plant or materials whether carried out by the Contractor or sub-Contractor, shall relieve the Contractor from his liability to complete the Contract works in accordance with the Contract or exonerate him from any of his guarantees.

1.24.1. Factory Acceptance Tests and Type Tests

The equipment listed below, shall require factory acceptance tests to be witnessed by 3 (three) employer's representatives (2 KETRACO Engineers and 1 Consultant's representatives)

- Tower and accessories
- Conductor/ shield wire/ OPGW
- Insulator
- Hardware, Fitting and accessories

The costs associated to carrying out the above FATs and Type Tests shall be borne by the Contractor. This shall include but not limited to:

- I. Return flight ticket on economy class for employer and consultant.
- II. Travel Insurance
- III. Visa application and processing fee and Local transport expense at the manufacture's country.
- IV. Full board accommodation in a minimum 4-star hotel including laundry services, International calls expenses, FAT documentation
- V. Daily stipend allowance of 200 USD per day for each of the employer's representatives for the total duration of FAT and Type Tests.

The contractor shall issue a 45day notification prior to commencement of the FAT and Type Tests. All FAT and Type Tests related documentation including Quality control documents, design documents, test record sheets, test procedures shall be approved before offering equipment for FAT and Type Tests. The duration of each FAT and Type Test shall be discussed and agreed by KETRACO and the Project Manager. This shall be reasonable enough to allow for conclusive testing of the equipment.

1.25. Erection, supervision and checking of work on site

The carrying out of all work on the Site included in this Contract shall be supervised throughout by a sufficient number of qualified representatives of the Contractor who have had thorough experience of the erection and commissioning of similar Works.

The Contractor shall ascertain from time to time what portions of the work on the Site the Employer's representative desires to check, but such checking shall not relieve the Contractor from the liability to complete the Works in accordance with the Contract or exonerate him from any of his guarantees.

If at any time it appears to the Employer's representative that the Contractor will be unable to complete any Section of the Works in the time stipulated, then the Contractor shall, if required by the Employer's representative, carry on such work outside normal working hours and shall

not make any claims for any extra expense thereby incurred unless, in the opinion of the Employer's representative, the delay is due to causes for which the Contractor would be entitled to an extension of time under the Conditions of Contract.

The Contractor shall satisfy himself as to the correctness of all connections made between the apparatus supplied under the Works and apparatus supplied under any other contract before any of the former is put into operation.

If the Employer's representative shall certify that defects have shown themselves in the Works, the Contractor shall, for the purpose of the maintenance after the completion of the Works provided for by the Conditions of Contract, keep on Site supervisory staff of such numbers and for such periods as the Employer's representative may require.

The Contractor is to keep the site, on which he erects or stores plant, reasonably clean removing all waste material resulting from the Works as it accumulates and as reasonably directed. On completion of the Works the Site is to be left clean and tidy to the satisfaction of the Employer's representative. Any damage done to buildings, structures and plant or property belonging to KETRACO is to be made good at the Contractor's expense.

1.26. Drawings, models and samples

A list of the drawings that are to be submitted by the Contractor with his Bid and a list of drawings to be submitted after the Commencement Date are given in the Drawings, Documentation and Samples section of this Technical Specification. The Contractor shall provide free of charge any additional drawings and/or copies of any reviewed drawings required by the Employer's representative.

The Contractor shall submit samples of materials as required from time to time by the Employer's representative.

The Contractor shall submit all drawings or samples of materials for review in sufficient time to permit modifications to be made and the drawings or samples resubmitted without delaying the initial deliveries or the completion of the Contract Works.

The number of copies of each drawing or of any subsequent revision to be submitted to the Employer's representative is given in Part 2, Section VII. Following review, further copies of the reviewed drawing shall be supplied to the Employer's representative for distribution to KETRACO and to Site.

Drawings for review shall be submitted electronically in a commonly used format and as paper prints and shall bear the authorized Contract reference.

All detail drawings submitted for review shall be to scale and of a size not less than 1/25 full size. All important dimensions shall be given and the material of which each part is to be constructed shall be indicated.

Except as otherwise specifically approved, all drawings shall be of size not greater than A0 (normally 841 mm x 1189 mm) nor smaller than A4 (normally 210 mm x 297 mm).

All dimensions marked on the drawings shall be considered correct although measurement by scale may differ there from. Detailed drawings shall be acted on where they differ from general arrangement drawings.

The Employer's representative reserves the right to request any further additional information that may be considered necessary in order fully to review the Contractor's drawings.

Any drawing modified from a previously submitted drawing shall bear a new version number. Revised drawings re-issued for review shall have at least one copy clearly marked indicating the amendments to the drawing. Revision boxes must be provided giving the date, revision letter and brief description of each drawing.

Any drawing or document submitted for information only shall be indicated as such by the Contractor. Drawings submitted for information only will not be returned to the Contractor unless the Employer's representative considers that such drawings do need to be reviewed, in which case they will be returned suitably stamped with comments.

All drawings submitted by the Contractor shall include the following particulars in the lower right hand corner: Contractor's name, date, scale, number and title of the drawing, contract number, overhead line title and equipment description.

The Contractor shall when submitting drawings provide an indexing system for all the drawings divided for each type of equipment.

The drawing format and the indexing system will be agreed at the first Contract meeting between the Contractor and the Employer's representative .

All prints shall be folded to A4 size and the title, drawing number and revision suffix shall remain visible.

Drawings, samples and models already submitted by the Contractor and reviewed by the Employer's representative (and such drawings, samples and models as shall be thereafter submitted by the Contractor and reviewed by the Employer's representative) shall not be departed from without the instruction in writing of the Employer's representative .

All drawings, samples and models shall be submitted in accordance with the provisions in the Schedules and shall become the property of KETRACO.

1.27. Responsibility of Contractor

Until each Section of the Works has been taken over or deemed to have been taken over under the Conditions of Contract, the Contractor shall be entirely responsible (save as is provided in the Conditions of Contract) for such section of the Works, whether under construction, during tests or in use for KETRACO's service.

During the period of maintenance, the Contractor shall make such arrangements as to ensure the attendance on the Site, within a reasonable time of his being called upon to do so, of a competent representative for the purpose of carrying out any work of maintenance for which the Contractor shall be liable and during such part or parts of the said period as the Employer's representative shall deem it necessary, the said representative shall be continuously available on the Site.

Any work that may be necessary for the Contractor to carry out in pursuance of his obligations under the Conditions of Contract shall be carried out so as to interfere as little as practicable with the normal operation of the generating station or substations. Work on the Site shall be carried out at such time and during such hours as the Employer's representative may require.

The Contract is to include the whole of the Works that are described in or implied in the Contract Document. All matters omitted from the Specification which may be inferred to be obviously necessary for the efficiency, stability and completion of the Works, shall be deemed to be included in the Contract Price.

Works shown upon the drawings, and not mentioned or described in the Technical Specification and Works described in the Technical Specification and not shown on the drawings will nevertheless be held to be included in the Contract and their execution is to be covered by Contract Price in the same manner as if they had been expressly shown upon the drawings or described in the Technical Specification.

1.28. Additional services of Contractor's staff

If the Employer's representative shall so require, the Contractor shall provide the services of skilled workmen for the repair of any defect with the Works or for any adjustments necessary which may occur in the period between KETRACO commencing to use any Section of the Works (whether taken over or not) and the expiry of defect liability period.

1.29. Contractor's employees

The Contractor shall fulfil all his obligations in respect of accommodation, feeding and medical facilities for all personnel in his employ, in accordance with the responsibilities imposed on him by the Specification or as necessary to ensure satisfactory execution of the Contract. He is also to comply with the requirements of all local Statutory Employment Regulations.

The Contractor shall be responsible for the behaviour on site of all personnel employed by him.

1.30. Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Laws of the Country, import, sell, give, barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift, barter or disposal by the Contractor's Personnel.

1.31. Packing and shipment

The Contractor shall prepare and pack all equipment and materials for shipment (by sea, rail, road, etc.) in such a manner as to protect them from damage in transit and against all climatic conditions experienced in transit and storage, and shall be responsible for and make good any and all damage due to improper preparation or loading for shipment.

Before being packed for shipment to the site, all items of the equipment shall be carefully numbered and marked so that they can be readily assembled and erected in the correct relative positions at the site. Wherever applicable, these numbers and markings shall be punched or painted so that they shall be clearly visible.

The whole of the materials shall be packed where necessary in non-returnable cases or on non-returnable steel-framed structure (steel cable drums) or otherwise prepared for overseas shipment in a manner suitable to withstand rough handling without sustaining damage.

Bundles of steel angle sections shall be properly tied together by an approved method and care taken to ensure that they are robust and not of excessive length for handling during shipment. The individual bundles shall be marked for identification by stamped metal labels. Particular care shall be taken by composing of bundles containing similar length of members and that the individual bundles do not have excessive weight for facilitate handling during shipment. Bundles may be as large as practicable to provide sufficient internal stiffness and resistance against excessive bending or deformation during lifting.

All individual pieces shall be marked with the plant identification number and the correct designation shown on the Contractor's detailed drawings and on other documents like packing lists, spare parts lists, operation and maintenance instructions, etc.

Marking shall be done identically on labels and by stamping the marks into the metal before painting, galvanizing, etc., and shall be clearly readable after painting, galvanizing, etc.

All parts of the plant shall be packed at the place of manufacture. The packing shall be suitable for shipment by sea and for all special requirements of the transportation to the site. Where necessary, double packing shall be used in order to prevent damage and corrosion during transportation, unloading, reloading and during intermediate storage.

All identical members shall be packed together, if reasonably possible, in a form convenient for shipment and handling.

Small items shall be packed in boxes and large items shall be protected, where necessary, by timber, straw and sacking.

All parts shall be suitably protected against corrosion, water, sand, heat, any adverse atmospheric conditions, shocks, impact, vibrations, etc. for later transport and storage.

Tube ends and other similar open ends shall be protected against external damage and ingress of dirt and moisture during transit and while awaiting erection at site. Flanged pipes shall have their open ends protected by adhesive tape or jointing and then be covered with a wooden blind flange.

Screws and nut nails shall fix the lids and internal cross battens of all packing cases.

The contents of the cases shall be bolted securely to the case or fastened in position with struts or cross battens, and not wedged in place with wooden shocks, unless these are fastened firmly in place. All struts or cross battens are preferably to be supported by cleats fixed to the case above and below to form ledges on which the batten may rest. Cases shall be up-ended after packing to prove that there is no movement of contents.

Unless the Contractor can offer an equally acceptable method, bundles of angles shall be arranged in rectangular formation with notched outer stout wooden battens to locate the angles, the battens being located sufficiently close intervals to form a strong homogeneous element.

The Contractor's attention is drawn to the provision of the Specification wherein the Contractor is required to suitably protect all steelwork before shipment to prevent damage to galvanized surfaces by white rust.

Packing cases where used shall be strongly constructed and in no case is thinner than 25 mm in thickness to be used. The contents of packing cases shall be securely bolted or fastened in position with struts or cross battens. Cross battens supporting weight in any direction shall not rely for their support on nails or screws driven lengthwise into the grain of the wood, but shall be supported by cleats secured from the inside.

Tower members shall be packed for shipment in bundles of the same size and weight containing pieces of the same or similar identifications mark and length. The individual members may be stacked to bundles and plastic spacers shall be placed in between the individual members, reducing the formation of wet storage stains. All bolts, nuts, washers, step bolts and minor fittings shall be shipped in wooden cases of suitable size and weight, with pieces properly separated according to size and type.

Crating together of components of dissimilar metals is not acceptable.

Particular attention shall be given to strutting before packing cases are fastened down. Cases shall be upended after packing to prove that there is no movement of the contents.

Timber wedges or chocks shall be firmly fastened in place to prevent their displacement when the timber shrinks.

Where bolts are used, large washers shall be fitted under the head and nut to distribute the pressure and the timber shall be strengthened by means of a pad.

All stencil marks on the outside of the casings shall be either of a waterproof material or protected by shellac or varnish to prevent obliteration in transit.

Wood wool shall be avoided as far as possible.

Waterproof paper and felt linings are to overlap at seams by at least 12 mm and seams shall be secured together in an approved manner but the enclosure is to be provided with screened openings to provide ventilation.

Each crate or package shall contain a packing list in a waterproof envelope. All cases, packages, etc should be clearly marked on the outside to indicate the total weight, show where the weight is bearing, the correct position of the slings and to bear an identification mark relating to the appropriate shipping documents.

The Employer's representative may be required to inspect and review the packing before items are despatched but the Contractor is to be entirely responsible for ensuring that the packing is suitable for transit and such inspection will not exonerate the Contractor from any loss or damage due to faulty packing.

Spare parts shall be packed for long duration storage. Individual steel members stacked in bundles as spare parts shall be spaced by plastic spacers. Wooden drums will not be accepted for the spare conductors, ground wires and OPGW.

All packing shall be included in the scope of delivery and the cost shall be included in the prices. The packing materials remain the property of the Employer.

1.32. Accommodation and site storage, Design Meeting, Internship and Graduates' Employment

Living accommodation. The Contractor shall make his own arrangements with regard to accommodation for his expatriate and locally recruited staff during the construction period. All dwellings and buildings existing or erected for the purpose by the Contractors shall comply with local regulations with regard to licensing/permits, construction, water supply, sanitation and other requirements. The Contractor shall provide temporary construction camps complete with proper sanitation and other necessary facilities. The Contractor shall be responsible for the construction and provision of all electrical supplies, water supplies, living accommodation, catering, services and amenities required by his employees for the duration of the Works. The location of all such facilities will be subject to approval by the Employer's representative .

All accommodation shall serve as permanent residences and form future communities, if such use can be foreseen or be removed by the Contractor when no longer required and before the granting of the final certificate. After the removal of accommodation, the ground shall be left in a clean and tidy condition.

Medical facilities. The Contractor shall be required to make his own arrangements to avail required Medical services for his expatriate or locally engaged staff.

Staff transport. The Contractor shall provide, at his own expense all necessary transport for his own men and materials.

General. Without prejudice to the generality of the several clauses of the Contract and except for the facilities referred to in this Clause, particular attention is drawn to the obligation of the Contractor to make his own arrangements at his own expense for supply and furnishing of offices, workshops, stores and store compounds and the watching and guarding of such.

Storage facilities. The Contractor shall make his own arrangements for storage areas and campsites. The Contractor shall in all cases obtain the approval of the Employer's representative for the places along the route of the lines where he intends to store materials. In no case will this be outside the authorized area unless special arrangements are made with the owners of adjacent property, at the Contractor's own expense. The Contractor is to provide any necessary protection and watchmen to safeguard materials in the areas allocated to him. The handling and storage of any equipment at the site is to be at the risk of the Contractor and without responsibility to KETRACO. The Contractor is to arrange for the protection to the satisfaction of the Employer's representative , of these materials against vermin attack, corrosion and mechanical damage during storage and erection at site.

The site storage areas shall be prepared with adequate hard-standing for the orderly storage of conductor drums, tower steel, insulators and fittings so that the material will not be damaged by the effects of adverse weather during storage. Items packed in flammable crates or drums shall be stored in such a manner as to limit the extent of any damage arising from fire.

Compressed air. The Contractor is to make his own arrangements for a supply of compressed air if required for the execution of the contract work.

Lifting facilities. The Contractor is to make his own arrangements with regard to lifting facilities required for transport or on site.

The land on which accommodation and office facilities are to be located shall be supplied/leased by the Contractor as part of the facilities.

In addition, contractor shall have mobile toilets and potable drinking water at site for workers.

1.32.1. Design Review Meeting

The Contractor shall arrange for design review meeting at the Contractor's home country's design office to be attended by a minimum of 6 Employer's representatives (4 KETRACO Engineers and 2 Consultant's representatives) for 10 days.

The detailed agenda items for the design review meeting shall be discussed and finalized at Contract negotiation and kick off meeting.

The Contractor shall provide for each Employer's representative the following:

- One economy class return air ticket including rescheduling if required
- Visa expenses, airport taxes and other incidental travel expenses as required.
- Full board 4-star hotel accommodation including laundry services and with international phone dial capability.
- Local transportation to the contractor's home office.
- Daily stipend allowance of 200 USD per day to cater for incidental expenses for the entire duration of the design review period.

1.32.2. Internship and Graduates' Employment

The Contractor shall accommodate five (5) graduates on internship for the entire duration of the Contract. The internship shall be for degree level of education and shall cover students in the following disciplines.

- Electrical engineering

- Civil and Structural engineering

A monthly stipend allowance of Ksh 25,000 shall be provided to each intern. While undergoing internship, the contractor should ensure the interns obtain maximum practical training on the various fields within the scope of works.

The contractor shall also employ at least one graduate electrical and one graduate civil engineer. The staff shall be maintained for the entire duration of the project. The graduate shall have had no more than 2 years' work experience. The minimum monthly remuneration for each graduate engineer shall be Kshs 100,000. The graduate engineer shall be supervised by a registered professional engineer. A training and experience report must be provided signed by the supervising engineer at the end of the project.

The details of the interns and graduates shall be provided by KETRACO.

1.33. Project Office accommodation for use of the Employer's representatives

The Contractor shall utilise appropriate existing buildings or provide such temporary buildings as may be necessary for office accommodation for Employer's representative staff during the erection of the works and the cost of these shall be deemed to be included in the Contract Price.

The Contractor shall also provide at his own cost, two furnished rooms in his site office to accommodate up to 6 representatives of the Employer's representative. The site office provided by the Contractor shall be fully furnished using a good standard of office furniture to be approved by the Employer's representative and fully equipped with:

- Software for multi-user access through network license server for entire life of project duration plus 3 years subscription for both software and web services post commissioning:
 1. MS Office- latest version
 2. AutoCAD for Windows permitting 8 users
 3. PLS-CADD Software(full options with all modules), PLS-Tower, PLS-Pole, permitting 3 users
- Four desks and chairs
- Four filing cabinets
- Eight (8) Laptops suitable for use with PLS-CADD, PLS-Tower, PLS-Pole, PSSE and AutoCAD
- One common printer (with photocopying and scanning capabilities) for both A3 and A4. The minimum specifications of the printer/scanner and photocopier as approved by the Employer's representative.

- Shelving units
- Toilet and sanitary facilities (comprising WC set, separate for gents and ladies, urinals, wash basin as approved by the Employer's representative)
- Air conditioning
- Lighting
- Sufficient number of fire extinguishers of suitable size and type
- Clean and safe bottled drinking water.
- High Speed Wi-Fi (Minimum 15mbps) for internet access.
- Tea/coffee/beverages and refreshments

NB: All the above items shall be new and shall remain the property of KETRACO during and upon completion of the project. All the software should be purchased under KETRACO's name and upgraded during the duration of the contract.

Six (6) of the laptops for the project team are to be provided with internet connection with service provided throughout the duration of the contract by a secure broadband internet service provider, for which the Contractor shall be responsible for all associated charges and costs. A UPS system shall be provided to support the computer systems for a minimum of 30 minutes in the event of a power failure. A backup generator shall be provided to power the office accommodation services. The computers and printer shall be networked on a LAN with facilities to access the Internet (broadband) on a continuous basis. The Contractor shall be responsible for all associated charges and costs.

Two (2) of the laptops will be handed over to KETRACO's Transmission System Planning for System Studies.

The laptops shall meet the following minimum specifications and its model shall be finalized with the Employer:

- Ports: USB type C, Audio jack (3.5mm), USB 3.0 ports, HDMI port,
- 1920x1080 display resolution (Full HD or 1080p)
- OLED or miniLED display
- Ports: USB type C, Audio jack (3.5mm), USB 3.0 ports, HDMI port,
- 1920x1080 display resolution (Full HD or 1080p)
- OLED or miniLED display
- FHD Touchscreen display
- Intel Core i7 H series or Intel Core i9
- 1TB Solid State Drive(SSD) PCIe or NVME
- NVIDIA RTX A2000 Graphics (8 GB GDDR6) (4Z8Q4AV)
- 24M Cache, up to 4.70 GHz
- Intel Turbo boost max 3.0 technology
- 32GB RAM
- 720p HD camera
- Wi-Fi 6 support

- Bluetooth 5 connectivity
- 15 -16 inch screen for portability
- Windows 11 Pro or latest-english version

- Genuine leather Laptop carry bag.
- Key Board-Full size, spill-resistant keyboard with drains
- Warranty-1year
- Integrated Security- Security Lock Slot plus steel cable (5.5mm thick) with a combination lock

In addition, contractor shall provide GPS device which shall be new and shall remain the property of KETRACO during and upon completion of the project. The GPS shall meet the following minimum specifications and its model shall be finalized with the Employer:

- 3.7 GB Micro SD Card
- Usage of Micro SD Cards with available topo maps
- 1.4"W x 1.7"H display size
- Built-in shaded relief basemap
- 24 hours battery life (AA batteries)
- Store 2000 waypoints
- Water-resistant

The Contractor shall provide safe bottled drinking water for the duration of the Contract, minimum daily 4 box 1.5liter bottled water.

Adjacent to the Employer's representative 's offices, adequate parking space shall be provided by the Contractor. The office accommodation is to be provided with reliable and constant electricity supply and water supply.

1.34. Office Accommodation Services

The Contractor shall be responsible for providing the following services to the Employer's representatives Office Accommodation:

1.34.1. Electricity Supplies

The Contractor shall be responsible for providing, obtaining and making all arrangements for the use for the Works of supplies of electricity required, including the provision at his own cost of all apparatus necessary for such use. All precautions which are necessary to ensure the safety of every person on the Site shall be taken. The Contractor's installation shall be to the satisfaction of the Employer's representative who may require the disconnection or alteration of any parts that he considers may be dangerous. Such installation shall comply also with all appropriate statutory regulations and be in accordance with IEC 60364 and IEC/TR 61200-704.

As soon as any parts or whole of the Contractors installation is no longer required for carrying out the Contract Works, the Contractor shall disconnect and remove the same to the satisfaction of the Employer's representative .

The Contractor shall be responsible for the installation and maintenance of a backup generator which shall provide the office accommodation with an electricity supply during power outages. The generator shall have the capacity to meet all office loads including lighting and air conditioning. The Contractor shall provide fuel for the generator throughout the duration of the Contract. The use of the generator is at the discretion of the Employer's representative. The standby generator shall be available for immediate connection at all times.

1.34.2. Water Supplies

The Contractor shall be responsible for providing, obtaining and making all arrangements for the use for the works of supplies of water required, including the provision at his own cost of all apparatus necessary for such use.

1.35. Employer's representative's transport and communications equipment

1.35.1. Transport

The Contractor shall provide transport services, for the use of the Employer and Employer's representative, on a 24-hour basis, as detailed further hereon. The number of vehicles to provide the transport services shall be as specified in the Price Schedules. The Contractor shall provide the services of one (1) driver mechanic (driver shall have defensive driving licence) per vehicle whose remuneration shall be not less than KES. 45,000.00 (net amount after statutory deductions) per month per driver for the entire Contract duration and not less than KES. 6,000.00 per night for travels outside Nairobi/permanent workstation as approved by Employer. The Contractor shall maintain each vehicle in efficient working condition, service it regularly as per the manufacturer's specification, repair, replace defective parts and tyres and provide fuel and oil and other consumables. The Contractor shall provide all documentation in accordance with Kenya Law, always including full comprehensive insurance cover for all vehicles and all drivers for unlimited Third-Party claims, at the rates stated in contract forms. A fuel card from a reputable oil company shall be provided for each vehicle loaded with a minimum of KES. 150,000 .00 per month.

The vehicles provided under the contract for use by the Employer/ Employer's representative are to be available for use by the Employer/ Employer's representative site supervisors (including reasonable personal use) within the general area of the entire project and Nairobi. The vehicles shall be available for their use 24 hours a day, seven days a week and shall be provided within two (2) months of Contract Effectiveness for both Type 1 and 2. Type 2 vehicles shall be handed over to KETRACO to be used for Operations and Maintenance. Although the maintenance, condition and roadworthiness of the vehicles are the responsibility

of the Contractor, the movements of the vehicles shall be entirely under the control of the Employer/Employer's representative site supervisors.

The vehicles shall be new (commonly referred to as zero mileage – with less than 100 km reading on the odometer), purchased locally (with a further requirement that pickup vehicles be a model assembled in Kenya commonly referred to as local assembly) and shall be approved by the Employer and Employer's representative before purchase. Each vehicle shall comply with all relevant road traffic laws and be right hand drive. The Contractor shall be required to always make the vehicles available during the Contract Period and until completion of the specified maintenance period and to provide replacement vehicles when the servicing or repair time (including accidents) exceeds a period of 24 hours. The provision of such replacement vehicles shall not be subject to additional payment. When a vehicle is out of action for any cause, the Contractor shall make a similar vehicle available for the Employer's representative use at the Contractor's expense.

Each vehicle shall be fitted with the following standard equipment: alternator, ammeter, oil pressure gauge, water/coolant temperature gauge, speedometer (km/h) with trip, ash tray, fire extinguisher (including fixing bracket and screws), exterior sun visors, external wing-mirrors, windscreen wiper unit, privacy glass or equivalent, rubber pads for clutch and brake pedals, spare wheel carrier with provision for lock, lockable fuel filler cap or compartment, locking doors and windows, towing pintle, steering damper, radiator chaff guard and all-terrain tyres.

Each vehicle shall be supplied with the basic maintenance tools together with spare belts (fan, cam serpentine and power steering), top and bottom radiator hoses, 6 fuses, a high lift jack, felling axe, cutlass, trenching tool, 15 m of 0.75 tonne fibre rope, inspection lamp and 5m of two core cable.

The Contractor will ensure that one spare tyre is available for each vehicle throughout the duration of the contract. All tyres will be of a roadworthy condition and fully comply with Kenyan Law. Each vehicle will be fitted with driver airbags and passenger airbags. All passenger vehicles shall be equipped with a hydraulic winch.

The vehicles shall be 4 wheel drive with additional low ratio gears for cross-country work and each vehicle shall be fitted with the following standard equipment: alternator, ammeter, oil pressure gauge, water temperature gauge, speedometer (km/h) with trip, ash tray, fire extinguisher (including fixing bracket and screws), exterior sun visors, external wing-mirrors, windscreen wiper unit (passenger side), rubber pads for clutch and brake pedals, spare wheel carrier on dished deluxe bonnet with provision for lock, bonnet lock, lock for spare wheel on bonnet, lock for fuel filler, locking doors and windows, radio interference suppressors, towing pintle, steering damper, front axle with reinforced casing, radiator chaff guard and cross-country tyres.

Each vehicle shall be supplied with the basic maintenance tools together with spare belts (fan, cam serpentine and power steering), top and bottom radiator hoses, 6 fuses, a high lift jack, felling axe, cutlass, trenching tool, 15 m of 0.75 tonne fibre rope, inspection lamp and 5 m of 2 core cable.

The Contractor will ensure that one spare tyre is available for each vehicle throughout the duration of the contract. All tyres will be of a roadworthy condition and comply fully with

Kenyan Law. Each vehicle shall be fitted with driver and passenger airbags. All Vehicles shall be equipped with a hydraulic winch. All vehicles shall be provided within two months of Contract Effectiveness.

On completion of the Contract, the type 1 vehicles and all its equipment shall remain the property of the Employer, and the contractor shall transfer the ownership to the Employer.

Vehicle Type 1:

VEHICLE TYPE 1: 2.0-3L BiT Diesel 10AT 4×4 Executive SUV XLT; **ENGINE:** **Capacity (cc)** 2000 cc Bi-turbo Diesel; Max power: 154kW@3750rpm; Max torque: 500Nm@1750-2000rpm; Number of cylinders: - 4, in-line; Cylinder diameter 84 mm; Cylinder stroke:-90 mm ; Maximum speed (km/h): 180km/h; Fuel: Diesel; Fuel tank capacity 80L **Emissions:** Euro4; Driving Modes Normal, Eco, Tow/Haul, Slippery, Mud/Ruts & Sand; 10-speed automatic; e-Shifter (4WD); Electronic Parking Brake Drivetrain: 4WD model with Terrain Management System; **TRANSMISSION:** Transmission type 10AT; Drive type: 4x4; **DIMENSIONS (mm):** Length (mm) 4940; Width (mm) 2207; Height (mm) 1841; Wheelbase (mm) 2900; Gross weight (kg) 3100; Ground clearance (mm) 229; Seats: 7-seats standard; Ebony leather accented seats with bolstering (excluding 2nd row middle seat and 3rd row seats) ; 8-way power driver's seat; 4-way manual adjust passenger seat; with bolstering (excluding 2nd row middle seat and 3rd row seats) Grille & Headlamps: Black front grille with chrome centre bar; C-Clamp LED headlamps; LED DTRLs (daytime running lights); LED front fog lamps; Wheels: 18" alloy wheels with machined-face finish; Driver's Cockpit: 8-inch Digital instrument cluster; Electronic Dual Zone Auto Air conditioning / Climate Control; Smart Keyless Entry with Push Button Start; Steering wheel reach and height adjust; Infotainment: 10-12-inch LED portrait screen with SYNC 4A; Embedded modem; Wireless Apple CarPlay & Android Auto; Wireless Charging Sound level: Moving (dB(A)) 75; Stationary (dB(A)) 77; **TIRES:** Wheel size 255/65R18 Allterrain; Rim 18" Alloy; Spare tire 17" Steel; Front brakes Disc – Ventilated; Rear brakes Disc – Ventilated; Front suspension MacPherson Strut; Rear suspension Coil Spring; Multi-Link System **EXTERIOR:** Front and rear mudguards -Yes; Grille - Painted Grille;Exterior door handle- Chrome; Side mirrors heated, electrical folding, and turn signal lights; Exterior mirrors with electric folding – Yes; Exterior mirrors - Body colour; LED lights- Yes ; Rear fog lamps – Yes; Daytime running lights – Yes; Roof rack – Yes; Roof rack – Chrome – Yes; Rear Spoiler - Yes; Rain Sensitive Wipers – Yes; **INTERIOR:** - Air conditioning- Electric dual- zone; Sun visor - Passenger with ticket holder, illuminated mirror & sliding - Yes; Roof storage - Driver sunglasses – Yes; Leather gear shift knob – Yes; Seats - Leather; Heated seats - Driver and passenger; Driver's seat adjustment – Manual/ Power 8-way; Passenger Seat Adjustment - Manual 4 way/Power 8 way; Second row seat - 60/40 folding – Yes; Third row seat electric folding – Yes; ; Electric front windows - one touch up/down; Driver and passenger; Rear electric windows – Yes; Leather steering wheel – Yes; Ambient lighting interior – Yes; Sunroof - Dual panel sun roof; **SECURITY:** Speed control – Yes; Adaptive Speed Control – Yes; Rear view camera – Yes; Rear, front and side view camera – Yes; ; Parking sensors - Rear Front & Rear Front & Rear; Automatic parking system – Yes; Pre-collision assistance, forward collision warning, automatic – Yes; Blind Spot monitoring – Yes; Lane keeping system – Yes; Belt reminder - Driver and passenger – Yes; Airbags - driver, passenger and side – Yes; IsofixYes; Central door locking- Yes; Keyless entry & start system- Yes; Security lock on rear doors – Yes; Remote alarm system- Yes; Multimedia controls - Steering wheel- Yes; Safetysystem ABS / ESP / RSC – Yes; **MULTIMÉDIA:** Display Multifunctional 10" ; Display Multifunctional 12"; Antenna AM/FM – Yes; Microphone- Yes; 8 speakers; Wireless charging.

Vehicle Type 2 :

Medium Truck, 4x2, 7.0-8.0 Ton, Cab Chassis: (3 units): • **Purpose:** Medium Trucks are essential for transporting materials, machinery, and personnel to different project sites, overhead lines, and substations especially in challenging terrains. • **Specifications:** • **Vehicle Type:** Open Cater, suitable for heavy-duty applications. A standard production, 4x2, diesel utility medium truck of latest design in the class, robust construction in current production and marketed in Kenya. Must be supplied new. Control Forward/Normal; Designed for heavy duty specifications, capable of operating in tropical conditions of mud and dust. Most suitable for operating on both "on and off" road conditions. Most suitable for fitting operating high lifting crane and cargo transportation. • **Dimensions and Weights:** Minimum overall length of 7400mm, Overall width approx. 2400mm, minimum overall height of 2500mm, Wheelbase of 4200mm. Length of chassis after Cab of 5000mm, Kerb weight 3500kg, Max. G.V.W. Aprox.13,500kg, Payload, within range 7,000-8,000kg, Permissible front (steering) axle load, max 5,500kg, Permissible rear (for dual wheels) axle load, max 8,500kg, Ground clearance, min 250mm. • **Engine and Powertrain:** Engine: Powerful diesel engine with above 4000 - 4600 CC Engine Capacity suitable for heavy hauling; Engine performance curves supplied; Diesel Engine, water cooled, 4 stroke; Mode of aspiration must be Turbo; Piston displacement, within range 7,000 – 8,500cc, Number of cylinders, minimum of six (6), Maximum power output /rpm, min 180hp/3,000rpm, Maximum torque developed/rpm, min 500Nm/1800rpm, disposable Air cleaner type, Disposable Oil and fuel filter type, Average fuel consumption (on full load) should not be below 1000km, Fuel tank capacity, min 200litres, Extra fuel tank fitted capacity Reserve of 100-litres. • **Clutch and Transmission:** Clutch must be dry single plate; Clutch system actuation, Hydraulic; Gearbox, synchromesh; Number of speeds, min. 5F, 1R; Drive configuration 4x2. • **Brakes, and Tires:** Brakes, hydraulic-pneumatic assisted; Mechanical parking brake, to act on transmission; Dual Rear tyres; Tyres size locally manufactured, Optimum tyre size as per the Manufacturer. • **Steering, Control and Cab:** Must be Right Hand Drive steering; power Steering type and fitted with working Seat belts. • **Chassis and Suspension:** Chassis Type: Robust and durable chassis suitable for heavy-duty use in rough terrains. Suspension: Heavy-duty suspension system to ensure stability and load-bearing capacity. Fitted with Suspension, front and rear heavy duty leaf springs with telescopic shock absorbers at front. • **Electrical System/Instruments:** Provision of a 24V System voltage, negative earth; Battery capacity and size of between 180 Ah and 240 Ah; Full lighting to conform to Cap 403, subs 23-Kenya Traffic Act; Standard instruments and gauges (or warning lights) for charging circuit, oil pressure, coolant temperature etc • **Modifications for Maintenance:** The following modifications and features are required to adapt the open canter vehicles for maintenance of electricity transmission lines and substation switchyards: Elevated Work Platform: Type: A hydraulically operated aerial work platform (cherry picker) with a minimum working height of [Specify Minimum Working Height]. Rotation: The platform should be capable of 360-degree rotation for flexible access to transmission lines and equipment. Load Capacity: The elevated work platform should have a safe load capacity for equipment and maintenance personnel. • **Body Construction:** Low-sided body; Body cross bearers of prestressed channel sections, 100x50x4.5mm equidistantly spaced at a maximum of 500mm apart. Suitable size well seasoned timber runners, with inverted steel section at top, between body frame and chassis; Body secured to chassis by U-bolts, diameter 16mm, held in position on wooden V-blocks; Body floor fabricated from 3.2mm thick mild steel plate (full width) reinforced at equal distances with box/channel sections; Steel platform body, made from mild steel chequered plate of thickness 3.2mm; Dropped tailgate and sides suitably reinforced; Suitable size toolbox to be fitted under body on the right hand side; Fixed cargo carrier clear of cab to create suitable space for fitting crane machine; Suitable rear mudguards fitted; Stone

guards fitted for taillights; Suitable size ladder fitted for the body cargo carrier; Chevrons and reflectors fitted on rear to conform to Kenya traffic act; All body steelwork to be thoroughly cleaned before painting. Both internal and exterior finish to be proceeded by one coat (ketraco-grey) and undercoat. Truck to be branded in KETRACO Corporate colors as per the provided color codes and instructions by the user; Body construction and all fitments to conform Cap 403 Kenya Traffic Act; Properly safeguard and expose number plate. • **Equipment Storage and Securement:** Storage Compartments: Adequate storage compartments to securely store tools, equipment, and materials required for maintenance tasks. Securement Devices: Built-in securing mechanisms to prevent equipment and tools from shifting during transit. • **Lighting and Safety Features:** Work Area Lighting: Bright and adjustable work area lighting to ensure visibility during night or low-light maintenance tasks. Safety Rails and Harness Points: Safety rails around the elevated work platform and harness attachment points for the safety of maintenance personnel. • **Auxiliary Power Source:** Inverter/Generator: An inverter or generator with sufficient capacity to power maintenance equipment and tools. • **Cabin and Comfort:** Cabin Type: A comfortable and spacious cabin for the driver and maintenance crew. Seating: Adequate seating for the driver and crew members. Air Conditioning: Air conditioning system for a comfortable working environment. Communication: Two-way communication system between the driver and the crew in the elevated work platform. • **Equipment:** Heavy duty type front fender; Laminated (safety) windshield; Sun visors supplied; Rear view mirrors (external both sides and internal) supplied; Full size spare Tyre with rim and carrier mounted under truck; Hydraulic (telescopic) jack, wheel brace & manufacturer's standard tools; Any other equipment (or accessories) supplied; Vehicle to be fitted with electronic speed governor; Governor to limit maximum speed to 80km/hr certificate provided; Governor to be tamper proof; Engine immobilize system fitted; Hazard Triangles metallic, Standard First Aid KS-2094-2007 and 1 Kg fire extinguisher; Supply addition Loose Floor rubber mats • **Safety Features:** Airbags, ABS, stability control, traction control and any additional safety features as per regulatory requirements. • **Accessories:** Air conditioning, power windows, and central locking. • **Warranty:** A manufacturer's warranty with service and maintenance package. Specimen of vehicle warranty to be submitted when tendering; Each vehicle supplied to carry a statement of warranty; Vehicle warranty duration min. 12 Months 40,000Km whichever occurs first; Vehicle Free Service on Labour & Parts. • **Compliance:** The vehicle must comply with Kenyan road regulations and standards. • **Manuals:** All literature in the English language; Repair manuals, supplied; Parts catalogue/microfiche/CD, supplied; Driver's handbook supplied; Service schedule supplied. • **GOK Inspection:** The Motor vehicle must conform to 403 Kenya Traffic Act. Vehicle to be registered with the Registrar of Motor under the Employer. Vehicle to be inspected by the Chief Mechanical and Transport Engineer for compliance with the specification prior to delivery to the Employer

Table 2: Vehicle Description

Item	Description	Quantity
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1	Type 1: Medium SUV type, 2.0-3L BiT Diesel 10AT 4x4 Executive SUV XLT or equivalent with air conditioning, full service and maintenance	10
2	Type 3: Medium Truck, 4x2, 7.0-8.0 Ton, Cab Chassis; 4000 - 4600 CC Engine Capacity	3

1.35.2. Project Communication Devices

The Contractor shall also provide at least twenty (20) mobile phone sets (smart phone, approved by the Employer) and four (4) satellite phones in this Lot for use in Project oversight by the Employer's Project Implementation Team with all usage charges relevant to the transmission project paid for by the Contractor. Mobile telephone coverage is to be provided for the length of the line by a major Kenyan mobile telephone service provider which provides coverage across the country.

The costs of providing mobile telephones (approved by the Employer) and a reasonable monthly airtime allowance (Kshs 5,000 per phone per month) is deemed incorporated into the project price. The specifications for the communication devices shall be submitted for approval by the Employer's representative. The project communication devices shall remain property of the employer upon completion of the project. The devices shall meet the following minimum requirements:-

Network Technology: GSM / CDMA / HSPA / EVDO / LTE / 5G or latest; **Body Dimensions:** 163 x 77.6 x 8.3 mm (6.42 x 3.06 x 0.33 in); **Weight:** 227 g (8.01 oz); **Build:** Glass front, glass back, titanium frame (grade 5); **SIM:** Nano-SIM + eSIM + eSIM (max 2 at a time; International); IP68 dust tight and water resistant (immersible up to 6m for 30 min); Apple Pay (Visa, MasterCard, AMEX certified); **Display Type:** LTPO Super Retina XDR OLED, 120Hz, HDR10, Dolby Vision, 1000 nits (typ), 2000 nits (HBM); Size: 6.9 inches, 115.6 cm² (~91.4% screen-to-body ratio); **Resolution:** 1320 x 2868 pixels, 19.5:9 ratio (~460 ppi density); **Protection:** Ceramic Shield glass (2024 gen); Always-On display; Platform: OS iOS 18, upgradable to iOS 18.4 or latest; **Chipset:** Apple A18 Pro (3 nm) or latest; CPU: Hexa-core (2x4.05 GHz + 4x2.42 GHz); GPU: Apple GPU (6-core graphics) or latest; Memory Card slot: No; Internal storage: 512GB 8GB RAM NVMe; **Main Camera:** Triple 48 MP, f/1.8, 24mm (wide), 1/1.28", 1.22µm, dual pixel PDAF, sensor-shift OIS; 12 MP, f/2.8, 120mm (periscope telephoto), 1/3.06", 1.12µm, dual pixel PDAF, 3D sensor-shift OIS, 5x optical zoom; 48 MP, f/2.2, 13mm (ultrawide), 1/2.55", 0.7µm, PDAF; TOF 3D LiDAR scanner (depth); Features: Dual-LED dual-tone flash, HDR (photo/panorama); Video: 4K@24/25/30/60/100/120fps, 1080p@25/30/60/120/240fps, 10-bit HDR, Dolby Vision HDR (up to 60fps), ProRes, 3D (spatial) video/audio, stereo sound rec.; **Selfie camera:** Single 12 MP, f/1.9, 23mm (wide), 1/3.6", 1.0µm, PDAF, OIS SL 3D, (depth/biometrics sensor); Features: HDR, Dolby Vision HDR, 3D (spatial) audio, stereo sound rec; **Video:** 4K@24/25/30/60fps, 1080p@25/30/60/120fps, gyro-EIS; Sound: Loudspeaker - Yes, with stereo speakers 3.5mm jack -No; Communication: WLAN, Wi-Fi 802.11 a/b/g/n/ac/6e/7, triband, hotspot; Bluetooth 5.3, A2DP, LE; Positioning: GPS (L1+L5), GLONASS, GALILEO, BDS, QZSS, NavIC; NFC – Yes; Radio -No; USB - USB Type-C 3.2 Gen 2, DisplayPort; Features: Sensors; Face ID, accelerometer, gyro, proximity, compass, barometer; Ultra-Wideband (UWB) support (gen2 chip); Emergency SOS, Messages and Find My via

satellite Battery Type: Li-Ion 4685 mAh; Charging Wired, PD2.0, 50% in 30 min; 25W wireless (MagSafe), 15W wireless (Qi2); 4.5W reverse wired Miscellaneous: **Colors** - Black Titanium/ White Titanium/ Natural Titanium/ Desert Titanium; Models: iPhone17,2 or latest , A1392 ; SAR 1.01 W/kg (head) 1.15 W/kg (body); SAR EU 1.22 W/kg (head)- 1.45 W/kg (body) 3DMark: 4731 (Wild Life Extreme); **Display**: 1796 nits max brightness (measured); Loudspeaker : -24.4 LUFS (Very good) Battery (new); Active use score 17:18h

The contractor shall provide four (4) satellite phones to be functioned in the transmission line route.

System/Frequencies		4G: B1, B3, B7, B8, B20, B28A 3G: B1, B3, B8 2G: B3, B8
SIM cards	Satellite 1 SAT SIM slot (Mini-SIM)	Cellular 1 SIM slot (Micro-SIM)
Data services	Satellite GmPRS up to 60/15 Kbps (down/up)	LTE/4G/5G up to 30 Mbps down up tp 9 Mbps up
Size (phone body)	Max: 140x60x30mm	
Weight	Max 250 g	
Satellite services	Calls, SMS, SMS to email	
Battery	3400 mAh battery: - up to 11 hours talk time, - up to 100 hours standby time	
Global Navigation, Satellite System (GNSS)	GPS, BeiDou, Glonass, Galileo	
Display	2.4" toughened Gorilla® glass outdoor display	
Ingress protection	Water resistant, dust resistant, shock proof (IP65/IK05)	
External interfaces	USB-C connector, Earphone connector, (3.5mm), Antenna connector for docking units	
PC compatibility	Win 11/10	
Environmental specications	Operating temperature: - 10° C to + 55° C	

1.36. Tools and Equipment for Erection, Installation and Commissioning

The Contractor shall provide all tools and special equipment required to erect, install and commission the plant to be supplied under this Contract.

1.37. Installation and Maintenance Instructions

The Contract Price shall be deemed to include illustrated installation and maintenance instructions written in English. The Installation and Maintenance Instructions shall be sufficiently detailed to enable a skilled maintenance person to undertake the maintenance, fault finding, repair or replacement activities that may become necessary during the life of the equipment.

The instructions are to be as simple and clear as possible, fully illustrated with drawings and diagrams as necessary and detailed with part numbers for ordering of replacements.

Further copies are to be reproduced as a book or books of approximately A4 size and bound into strong black durable imitation leather covers inscribed upon the front generally in the form of the title page to this document except that the references to Specification, Conditions of Contract, drawings, etc., will be replaced by "Installation and Maintenance Instructions".

The name of the main Contractor, but not that of any subcontractor, may also be inscribed upon the cover after the description of the plant. The name of KETRACO shall be inscribed upon the spine.

The finished books are to be handed to the KETRACO not later than 1 month before the Taking-Over Certificate is issued.

Furthermore, the Contractor shall provide Operation and maintenance Tools and equipment for transmission lines, this includes but is not limited to:

- Earth Resistance Testing unit
- Torque wrench (60-120Nm)
- Torque wrench (140-310Nm)
- Motor operated Hydraulic press & Die Kit for Lynx Conductor
- Tirfor for steel wire rope (3.5T)
- Tirfor for steel wire rope (7T)
- Steel wire rope 14 mm X 50 M Legth piece
- Wire clip (14mm Crosby type)
- Wire connector 14 mm rotating swivel type
- Stringing stocking/tension type grips for ACSR Lynx Conductor
- Stringing stocking/tension type for OPWG
- Automatic clamp (Chicago Grip)
- Chain pully block 3 T
- Chain pully block 6 T
- Total Station
- Thermo-Vision Scanner
- Binocular
- Safety packages: belt, helmet, gloves, shoes,
- Contractor shall finalize the list, type and quantity of tools and equipment with the Employer.

1.38. Training

The Contractor shall provide on-site training to KETRACO staff during all stages of the installation works.

There shall be no limitation on the number of KETRACO staff to be trained at site during the entire project duration. The language of the training shall be English.

The employer's personnel will be present during the installation and testing and commissioning stages of the project and will be fully involved in the activities.

The Contractor shall also provide specific training for KETRACO's personnel. The training shall take place during the design stage at the contractor's home country or a reputable training centre preferably run by a manufacturer or power transmission electricity utility.

The specific training for the project shall include but not limited to the following:

1. Civil/structural Engineering (4 Design Engineers and 2 TSP Engineers for 3 weeks)
 - 1.1. Transmission line tower design
 - 1.2. Transmission line foundation design,
 - 1.3. Use of relevant software in design (e.g PLS-Tower and PLS -CADD)
2. Transmission Line Engineering (4 Design Engineers and 2 TSP Engineers for 3 weeks)
 - 2.1. Transmission line electrical design
 - 2.2. Use of relevant software in design
 - 2.3.
3. Emergency Restoration System (2 Engineers - 2 weeks)
 - 3.1. Special software training for analyzing emergency restoration structures
 - 3.2. Installation procedure (assembly of modular structures, fixing of foundation plates, erecting of structures on the foundation, guying the tower with anchoring arrangement, stringing of conductor)
 - 3.3. Dismantling procedure
4. Operations & Maintenance (10 Technicians for 2 weeks)
 - 4.1. Safety procedures
 - 4.2. Operation and maintenance in transmission lines

The technicians training shall be more of practical site training involving the trainees. The training will be tailored for transmission line operators and maintenance engineers with a task of equipping the staff with operation principles as well as capacity for trouble shooting. This shall be well structured to last for two (2) weeks at site.

The Contractor shall submit a detailed site training proposal for review/approval by Employer/Project Manager.

For each of the training above that is not held within the client's country, the Contractor shall provide for each KETRACO staff the following:

- One economy class return air ticket
- Visa expenses, airport taxes and other incidental travel expenses as required.

- Full board accommodation in a minimum 4-star hotel including laundry services and with international phone dialling capability for the entire training duration
- Local transportation.
- Daily allowance of 200 USD per day for the duration of the training

1.39. Climate Change Impact Mitigation

The contractor shall undertake a tree planting exercise at location(s) to be identified in consultation with KETRACO, the community and relevant authorities. The contractor shall plant trees worth KES 5,000,000 or at least 30,000 trees whichever is higher. The tree planting exercises commence immediately after contract effectiveness. The cost shall be deemed to cover the entire exercise which shall involve the following:

1. Selection of trees species with the highest survival rate and can grow with baseline environmental conditions at the selected planting locations.
2. Transportation of the seedlings to the selected planting locations.
3. Preparation of the land including but not limited to clearing the site of invasive species and preparing the hole.
4. Planting the seedlings at the onset of long rains
5. Protection and care of the planted tree for a period of 12 months.

1.40. Corporate Social Responsibility

The Contractor shall implement CSR projects for the community. The total cost of the CSR projects to be implemented shall be at least KES 10,000,000. The projects to be implemented shall be determined in consultation with KETRACO and the local communities. The contractor shall design and implement the CSR projects selected.