#### FORM-C

## FORM C: TENDER FORM

CURRENT TEND	ER DETAILS
Request number:	13/06/2023/GAU-(EL)
Request for Tender:	APPOINTMENT OF A CONTRACTOR FOR THE RECONSTRUCTION OF THE 3KV DC TRACTION AND AC DISTRIBUTION SUBSTATIONS BETWEEN ANGLERS AND HOUTHEUWEL TRAIN STATION FOR THE PERIOD OF SIX MONTHS
I / We (Insert Name of Te	ndering Entity)
•	
(Full address) Conducting busine	ss under the style or title of:
Represented by:	
in my capacity as:	
Participants, as the offer to undertake at the bills of quantitic accordance with the particular to the content of the content	sed thereto by a Resolution of the Board of Directors / Certificate of Partners, Members or a case may be, dated, a certified copy of which is annexed hereto, hereby and complete the above-mentioned work (hereinafter called "the WORKS") at the prices quoted in es / schedule of quantities or, where these do not form part of the contract, at a lump sum, in the terms set forth in the accompanying letter(s) reference and dated (if any) and the documents listed in the accompanying schedule of tender documents for the
	(amount in words), (All applicable
taxes included)	

- **N.B.** (i) In the event of any discrepancy, the amount in words will take precedence over the amount in figures.
  - (ii) Where items in the priced bills of quantities submitted with the tender for the WORKS other than architectural building work are incorrectly extended arithmetically, the unit rate will be treated as decisive.
  - (iii) In tenders for architectural building work the total amount will be treated as decisive. If amounts for individual items cannot be reconciled with the total amount, the amounts for individual items shall be adjusted to the satisfaction of the PRASA to conform to the total amount.

	are hereby authorised to negoender Negotiations with shortlis	otiate on behalf of the abovementioned entity, should PRAS sted bidder(s).
FULL NAME(S)	CAPACITY	SIGNATURE
		at the prices quoted in the schedule of prices in accordance of prices in accordance of RFP documents.
and, if any, its covering lette	er and any subsequent exchan	and issue me / us with the notice of acceptance, this tend ige of correspondence together with the PRASA acceptance tract to be concluded between the PRASA and me / us.
Securities and Insurance wi	thin <b>30 (thirty)</b> working days of the PRASA to do so within <b>7 (</b> s	of of the necessary coverage for Workmen's Compensation of notification of awarding of the contract, and to sign a form (seven) working days of notification by the PRASA that the
(in words) from the date of relaid down in the project spowors works or any stage of the the PRASA I / we shall pay provision is made in the pro-	ecification and to such extension within the period(s) so to the PRASA in terms of the C	thin tance of the tender, subject to completion in stages if and a sions of time as may be granted. Failing completion of the stipulated or by such extended date(s) as may be allowed be Conventional Penalties Act 15 of 1962, the penalty for which ag of any alterations, extras, additions or omissions shall n
I / we can prove to the rea	asonable satisfaction of the PF	vill be considered by the PRASA, but shall be granted only RASA that the penalty is out of proportion to the prejudic n respect of which the penalty was stipulated.
I / We declare that this ten closing date is required).	der holds good until	(a minimum period of 90 days fro
I / We further agree that if. a	after I / we have been notified o	of the acceptance of my / our tender, I / we fail to enter into

formal contract if called upon to do so, or fail to furnish satisfactory security for the due and proper completion of the

WORKS, the PRASA may, without prejudice to any other legal remedy which it may have, recover from me / us any expense to which it may have been put in calling for tenders afresh and / or having to accept any less favourable tender.

I/We undertake, in the event of my/our tender being accepted, to deposit with the PRASA as security for the due and proper completion of the WORKS, a Performance Bond issued by a South African registered Bank to the value of **ten** (10) per cent of the contract price (VAT inclusive).

I/ We declare that, being a company / partnership / close corporation / joint venture, I / we have duly completed the annexe hereto and certified it as correct.

The several documents involved are to be taken as complementary to each other. In the event of any conflict between the content of any of the documents listed in the schedule of tender documents (other than the project specification) and the project specification, the latter shall prevail. In the event of any conflict between the letter that accompanies the tender or other relevant correspondence and the contents of the documents listed in the schedule of tender documents (including the project specification) such letter or correspondence shall prevail.

I/we agree that non-compliance with any of the material terms of this RFP, including those mentioned above, will constitute a material breach of contract and provide PRASA with cause for cancellation.

	THIO DONE and GIONED at		
	THUS DONE and SIGNED at day of		
	day or		
	DULY AUTHORISED SIGNATORY(IES	S) WITNESSES	
1.		1.	 
2.		2.	 
3.		3.	 

## **PRICING SCHEDULE**

# PRELIMINARY AND GENERAL For he 3 kV DC Traction, and AC Distribution Substations between Anglers

The reconstruction of the 3 kV DC Traction, and AC Distribution Substations between Anglers Train Station and Houtheuwel Train Station

Item	Description	Unit	Quantity	Rate	Amount
1,0	DESIGN WORK				
1,1	Structural Engineer services and buildings certificate of occupancy.	sum	1		
1,2	Complete design for 3kV DC Traction and AC Distribution substations	sum	1		
1,3	Design complete toilet facility for 3kV DC Traction substations including Municipality approvals.	sum	1		
1,4	Civil design and completion certificate for 3kV DC Traction and AC Distribution substations approved by professional Civil Engineer or Technologist.	sum	1		

1,5	Electrical design and completion certificate for 3kV DC Traction and AC Distribution substations approved by Professional Electrical Engineer or Technologist.	sum	1	
1,6	Electrical Protection and Earthing system designed and approved by Specialist.	sum	1	
1,7	Soil resistance test for Earth Mat and report approved by a Specialist.	sum	1	
1,8	Electrical fence design and installation Completion certificate approved by Specialist	sum	1	
1,9	Telecommunication system design and installation completion certificate approved by a specialist	sum	1	
1,10	Design intrude alarm system and installation completion certificate approved by a specialist	sum	1	
1,11	Buildings Electrical Certificate of Compliance (CoC) for all Substations buildings	sum	1	
	T			
2,0	FIXED CHARGE AND VALUE RELATED ITEMS			
2,1	SANS 1921-1-2004: Part 1: General Engineering and Construction Works.	sum	1	
2,2	Compliance with Environmental requirements.	sum	1	
2,3	Compliance with Health and Safety requirements.	sum	1	
2,4	Transportation of Contractors Staff to and from sites. Contractor to specify the type of transport.	sum	1	
	Other Compliance with Quality			

3,0	ESTABLISHMENT OF FACILITIES ON SITE FOR THE CONTRACTOR			
3,1	Communications	sum	1	
3,2	Signage on each site.	sum	1	
4,0	SCHEDULED TIME RELATED ITEMS.			
4,1	Offices and Storage Sheds.	Months	6	
4,2	Chemical Toilets.	Months	6	
4,3	Workshops.	Months	6	
4,4	Tools, Ladders, Scaffolding and Ropes.	Months	6	
4,5	Water Supply and Electrical Supply.	Months	6	
4,6	Plant and Equipment.	Months	6	
4,7	Protective Wear, Safety Clothing and ID's.	Months	6	
4,9	Light Duty Vehicles (LDV's).	Months	6	
4,10	Trucks.	Months	6	
4,11	Cranes.	Months	6	
4,12	Machinery and Plant required for Earth Works.	Months	6	
4,13	Other Construction Vehicles.	Months	6	
4,14	Security x 24 Hours. As per the Health and Safety Spec	Months	6	

4,15							
	Community Liaison Officer	Month	6				
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5,0	CONSTRUCTION MANAGEMENT & SUPERVISION FOR THE DURATION OF CONSTRUCTION.	Months	6				
6,0	TESTING OF TRANSFORMER.						
6,1	Allow an amount for the PRASA three employee i.e. (Project Manager, Technical Staff and Engineer) to conduct an out of tank inspection on the transformer and to witnessing all routine manufacturers tests carried out by the manufacture in the land of origin.	sum	1				
6,2	In terms of the Contract allow an amount for Type Tests of the transformer if such tests does not exist.	sum	1				
7.0	SITE DE-ESTABLISHMENT						
7.1	Removing facilities from site	sum	1				
7.2	Site rehabilitation	sum	1				
TOTAL	TOTAL FOR PRELIMINARY & GENERAL CARRIED FORWARD TO THE SUMMARY OF PRICES						

		<u> </u>			
			QUANTITIES		
	A bidder shall refer to the Project		AND CIVIL Wation for det		ation per item
Item	Description	Unit	Quantity	Rate	Amount
	-				
1,0	88kV HV METAL OXIDE SURGE ARRESTERS				
1,1	Design, supply and construct a foundation/s for an 88kV AC HV Metal Oxide Gapless Surge Arresters for an outdoor yard complete.	set of 3	1		
1,2	Design, supply and construct support steel structure/s for 88kV AC Metal Oxide Gapless Surge Arresters for an outdoor yard complete.	set of 3	1		
	Design, supply and install an 88kV AC HV Metal Oxide				
1,3	Gapless Surge Arresters for an outdoor yard complete with associated components.	set of 3	1		
					T
1,4	Supply cables and termination as well as protection integration of 88kV HV AC Metal Oxide Gapless Surge Arresters to each phase of medium voltage supply and substation main earth electrode/earth mat.	Sum	1		
2,0	88kV HV AC MOTOR OPERATED DISCONNECT SWITCH				
2,1	Design, supply and construct a foundation/s for an 88kV AC Motor Operated Disconnect switch for an outdoor yard complete.	set of 3	1		

2,2	Design, supply and construct support steel structure/s for 88kV AC Motor Operated Disconnect switch for an outdoor yard complete.	set of 3	1	
2,3	Design, supply and install an 88kV AC HV Motor Operated Disconnect switch for an outdoor yard complete with associated components.	set of 3	1	
2,4	Supply cables and termination as well as protection integration of 88kV HV AC Disconnect Switch to Control Panels.	Sum	1	
3,0	88kV HV AC PRIMARY CIRCUIT BREAKER			
3,1	Design, supply and construct a foundation/s for 88kV AC Primary Circuit Breaker for an outdoor yard complete.	Each	1	
3,2	Design, supply and construct support steel structure/s for 88kV AC Primary Circuit Breaker for an outdoor yard complete.	Each	1	
3,3	Design, supply and install an 88kV AC HV Primary Circuit Breaker for the outdoor yard complete with associated components.	Each	1	
3,4	Supply cables and termination as well as protection integration of 88kV HV AC Primary Circuit Breaker to Control Panels.	Sum	1	
4,0	CURRENT TRANSFORMERS			

4,1	Design, supply and construct a foundation/s for 88kV AC Current Transformer for an outdoor yard complete.	Sum	1		
	T =		T	T	T
4,2	Design, supply and install 88kV, HV Current Transformers in the set of two complete with associated components.	Set of 2	1		
			T	1	T
4,3	Supply cable and termination as well as protection integration of 88kV HV AC Current Transformers to Control Panels.	Sum	1		
5,0	6.1 MVA TRACTION TRANSFORMER				
3,0	See specification BBB5019 and BBB8205				
	T		T	Γ	
5,1	Supply and install a 6.1MVA Traction Transformer with vector group determined by the designer and voltage ratio of 88kV/1.22kV/1.22kV/2.36kV complete with all the necessary ancillary equipment and material. The transformer impedance shall not be less than 8%.	Each	1		
6,0	AUXILLIARY TRANSFORMERS				
	See specification BBB8204				
	,		T	<b>.</b>	
6,1	Design, supply and install a 100kVA, 2.36kV/400V, Dyn11, 3-phase AC, 50Hz Main Auxiliary Transformer complete.	Each	1		
	T =		<u> </u>	Г	
6,2	Design, supply and install 88kV gapless surge arrester complete.	Each	3		

6,3	Design, supply and install a 400V, 3P, 150A, 25kA, plug-in, draw-out type circuit breaker complete.	Each	1	
	,		T	
6,4	Supply and install the LV circuit breaker weatherproof stainless steel enclosure box, IP55 and support galvanised steel pole complete with circuit breaker tray, gland plate, support bracket, bolts, nuts and washers.	Each	1	
		L		
7,0	ELECTRICITY METERING			
	See SANS 474:2006; NRS 057:2005			
	001.2000	1		
	Design, supply and install			
7,1	complete metering system with associated equipment and cables	Sum	1	
8,0	CONCRETE PLINTH AND BUNDWALL FOR TRANSFORMERS			
8,1	Supply and install Main Traction and Auxiliary Transformer plinth and bund wall.	Each	1	
9,0	CABLES AND BUSBARS			
	See specification BBC 0198, CEE-0023.			
9,1	Supply and install suitably rated 6.6kV AC XLPE type A (three core) 25mm² copper cable complete with all the necessary termination kit to supply power to the main auxiliary transformer fed from 2.36kV of the traction transformer tertiary.	m	300	

9,2	Supply and install 110mm diameter HDPE sleeve pipes for cables crossing the railway lines.	m	500	
9,3	Supply and install 100mm <sup>2</sup> Cu, PVC insulated negative return bonds from the negative return manhole busbar to rail.	m	200	
9,4	Supply and install a negative manhole busbar with a minimum continuous rating of 4000A.	m	2	
9,5	Supply and install suitably rated 88kV AC XLPE type A (three core) 50mm2 copper cable complete with all the necessary termination kit.	m	300	
9,6	Supply and install suitably rated 6.6kV/11kV AC XLPE type B (single core) 630mm <sup>2</sup> Aluminium cable complete with the necessary termination kit for the main 3kV DC circuit and connection to the negative bus bar inside the building.	m	600	
9,7	Supply and install 800mm <sup>2</sup> Aluminium feeder wires with associated structures, termination kit to supply power to OHTE and provision for the return cable.	m	1000	
9,8	Supply and install control cables	Sum	1	

9,9	Supply and install suitably rated (100x10mm) rigid flat copper bus bars (2 parallel bus bars per phase arrangement) between the secondary winding of the traction transformer and the wall bushings, complete with flexible removable connections to avoid overstressing of connections and insulators. The bus bars shall also be for the interconnection between the wall bushings and the rectifier (2 parallel bus bars per phase arrangement), from the rectifier to the reactor and to the positive isolator for the main positive bus bar on the wave filter equipment. The bus bar shall also include the negative return circuit and wall insulators. Bus bars shall be colour coded and to be SANS approved.	m	200	
	TRACTION SUBSTAITION			
10,0	BUILDING AND ASSOCIATED EQUIPMENT			
10,1	<ol> <li>Refurbish substation building/s and associated structures with vandal-proof doors.</li> <li>Supply and deliver Security guardroom as per section 4.1.5</li> </ol>	Sum	1	
40.0	A			
10,2	Associated Equipment			
10.2.1	Supply a self-supporting aluminium ladder with a height not exceeding 1.5m	Each	1	
10.2.2	Supply and mount against the wall a key box with a lid and make provision for at least 15 keys.	Each	1	

10.2.3	Supply and install suitable brackets for storing the ladder, special tools and earthing apparatus, and also brackets on the wall immediately adjacent to the annex door for mounting of fire extinguishers.	Sum	1		
		<u> </u>		1	
10.2.4	Supply a steel cabinet/desk combination approximately 1150mm wide, 600mm deep and 1200mm high.	Each	1		
10.2.5	Supply and mount on the wall above the desk an A1 size picture frame with transparent cover.	Each	1		
	Г <u></u>	T			
10,3	Toilet Facility				
10.3.1	Design, supply and construct complete unisex toilet with associated accessories and connect sewer pipe to municipalities main network.	Sum	1		
		1			
11,0	FENCING, GATES AND KERBING				
11,1	Welded Mesh Fence and Gates				
11.1.1	Supply and install a 1.8m welded mesh fence complete.	m	350		
				1	
11.2.2	Supply and install a 1.8m welded mesh fence gate complete.	Each	2		
				1	
11.2.3	Supply and install a 1.2m welded mesh fence complete.	m²	50		

11.2.4	Supply and install a 1.2m welded mesh fence gate complete.	Each	1		
12,0	EXCAVATION, BACKFILLING AND COMPACTION				
	See Specification CEE-0023				
12,1	Platform				
12.1.1	Excavate existing ground to prepare insitu layer and compact. Supply and compact final layer G5 material and backfill foundation trenches.	m³	60		
12,2	Cables and Earthing				
,					
12.2.1	Excavations for trenches in soil, importation of soil as per specification to bed cables, backfilling of trenches, compacting with mechanical rammer.	m³	96		
	OUTDOOR EARTH MAT				
13,0	See specification CEE-0177, BBB3059, BBB5452, BBB2721				
			1	1	T
13,1	Supply and install a complete earth mat in the substation yard and also adhering to drawing no. BBB3620.	Sum	1		
13,2	Supply and install 95mm <sup>2</sup> PVC insulated stranded copper conductor to bond various equipment to the earth matt complete with copper tinned lugs. Copper conductor and lugs to be SANS approved.	m	150		

13,3	Supply and install anticorrosive compound such as Noxide to all crimped connections and exothermic welds.	Sum	1		
13,4	Allow a rate to braze or exothermic weld all the below ground connections.	Sum	1		
13,5	Supply and install Malthoid or any approved insulation material to insulate the main traction transformer from concrete plinth.	Sum	1		
	T		Ι	T	T
13,6	Supply and install copper earth rods of 1.5m in length, which are suitably threaded to each end complete with a coupling and two brass rod termination clamps. Earth rods to be installed as per drawing BBB 3620. Earth rods not to be less than 70mm² copper in accordance with SANS1063.	Sum	1		
	L		I.		l.
13,7	Supply and install braded copper bonds on all gates. Bonds shall be painted silver. Wire size bonds shall be the equivalent of 95mm² copper conductor.	Sum	1		
13,8	Supply and install AC earth leakage current transformer	Each	2		
13,9	Supply and install a weatherproof stainless-steel enclosure in which to house the AC earth leakage current transformer complete with the mounting required.	Each	2		

Supply and install environmentally approved weed killer and then a 100mm layer of crusher stone.	m²	1000	
ANODE WALL PLATE AND BUSHINGS			
Supply and install a hot dip galvanised Anode Wall Plate	Set	1	
Supply and install suitably rated wall bushings	Each	6	
YARD LIGHTING			
Design, supply and install wall mounted 400 W outdoor industrial lights with associated components including clamps, cables, fittings, protective steel cage.	Each	8	
Supply and install a solid-state type of light-sensitive control unit with an impact resistance translucent cover.	Each	1	
Design, supply and install Emergency outdoor lights supplied by solar panels.	Each	4	
3kV DC RECTIFIER			
	environmentally approved weed killer and then a 100mm layer of crusher stone.  ANODE WALL PLATE AND BUSHINGS  Supply and install a hot dip galvanised Anode Wall Plate  Supply and install suitably rated wall bushings  YARD LIGHTING  Design, supply and install wall mounted 400 W outdoor industrial lights with associated components including clamps, cables, fittings, protective steel cage.  Supply and install a solid-state type of light-sensitive control unit with an impact resistance translucent cover.  Design, supply and install Emergency outdoor lights supplied by solar panels.	environmentally approved weed killer and then a 100mm layer of crusher stone.  ANODE WALL PLATE AND BUSHINGS  Supply and install a hot dip galvanised Anode Wall Plate  Supply and install suitably rated wall bushings  Each  YARD LIGHTING  Design, supply and install wall mounted 400 W outdoor industrial lights with associated components including clamps, cables, fittings, protective steel cage.  Each  Supply and install a solid-state type of light-sensitive control unit with an impact resistance translucent cover.  Design, supply and install Emergency outdoor lights supplied by solar panels.  Each	environmentally approved weed killer and then a 100mm layer of crusher stone.  ANODE WALL PLATE AND BUSHINGS  Supply and install a hot dip galvanised Anode Wall Plate  Supply and install suitably rated wall bushings  Each  Obesign, supply and install wall mounted 400 W outdoor industrial lights with associated components including clamps, cables, fittings, protective steel cage.  Supply and install a solid-state type of light-sensitive control unit with an impact resistance translucent cover.  Design, supply and install Emergency outdoor lights supplied by solar panels.  Each  1  Each  4

15.3.1	Design, supply and install a 6MW AC to DC rectifier complete with control panel and instruments, a diode monitoring panel with displays, cooling fans, attenuation circuit and associated equipment. The rectifier shall be of the 12-pulse configuration type.	Each	1	
15.3.2	Design, supply and install a rectifier bay screen manufactures from 25mm woven wire type expanded metal fixed to an angle iron frame supported by square pillars complete with a bay gate and fixing material per rectifier unit. The rate to include the painting of screen, gate and pillars.	Set	1	
16.0	REACTOR COIL			
16,0	See specification BBB3890, BBB5452			
16,1	Supply and install a 1.8mH, air core reactor, complete with insulators and mounting brackets.	Each	1	
17.0	WAVE EILTED FOLIDMENT			
17,0	WAVE FILTER EQUIPMENT See Specification BBB3139, BBB3162, and BBB 5452			
17,1	Supply and install wave filter 1.173mH inductor coils complete with associated components and BBB3483.	Each	1	
	Supply and install wave filter			

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17,3	Supply and install dry type wave filter 10uf capacitors complete with associated components.	Each	2		
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17,4	Supply and install dry type wave filter 50uf capacitors complete with associated components.	Each	1		
	,			<u></u>	<u>,                                      </u>
17,5	Supply and install wave filter discharge 75kΩ, 150kW resistor on a suitable panel or bar complete with discharge and earthing mechanism.	Each	4		
			•		
17,6	Design, supply and install frames and support brackets for the mounting of the wave filter capacitors, inductors, resistors and associated equipment.	Each	1		
17,7	Supply and install a fuse holder mounted on insulators complete with a 100A HRC fuse to protect the wave filter equipment and isolating and earth switch.	Each	1		
			l	l	
18,0	3kV DC POSITIVE ISOLATOR AND UNDER VOLTAGE RELAY				
	See specification BBB4724, BBB3005				
					<u> </u>
18,1	Supply and install positive isolator and earthing switch complete with operating mechanism situated in a metal panel complete with metering and wiring.	Each	1		
			<u> </u>		

18,2	Supply and install a 3kV DC under voltage relay as part of the low voltage control gear of the positive isolator, complete with 3kV DC voltage divider, optic fibre transmitter, optic fibre receiver and control circuitry.	Each	1		
19,0	MECHANICAL KEY INTERLOCKING SYSTEM				
			1		
19,1	Supply and install a mechanical key exchange system to prevent on load operation.	Set	1		
			•		
20,0	3kV DC MODULAR HIGH SPEED CIRCUIT BREAKER PANEL				
	See specification CEE-0099, CEE-0227, BBB5452				
20,1	3kV DC High Speed Circuit Breaker				
			1		
20.1.1	Supply and install 3kV DC, 4000A, HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB.	Each	4		
20.2	Electronic Control Relay		1		
20,2	LICCHOING CONTROL Relay		<u> </u>	<u> </u>	
20.2.2	Supply and install an Electronic Control Relay with a 2-year warranty as per the requirements stated in clause 9.3.11 of the Scope of Works.	Each	4		

20,3	3kV DC Universal Busbar Earth Switch			
20.3.1	Supply and install a separate 3kV DC positive bus bar earth switch completes with electrical interlocking, mechanism and indication lights to be connected.	Each	1	
21,0	PRIMARY CIRCUIT CONTROL PANEL AND AC/DC DISTRIBUTION PANEL			
	See specification BBB2721			
21,1	Primary Circuit Breaker Control Panel			
21.1.1	Design, supply and install an indoor floor standing primary circuit breaker control panel complete with flag annunciator unit, protection relays (IEDs), phase failure relays, instruments meters, control equipment, event and fault recorder, indicating lights, a panel light, emergency stop button, terminal strips, bus bars, protection test blocks, wiring labels etc.	Sum	1	
21,2	AC/DC Distribution Panel			
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21.2.2	Design, supply and install an indoor floor standing AC/DC distribution panel complete with relays, instruments, meters, selector switches, AC and DC circuit breakers, isolators, earth switches, lightning arresters, a panel light, change over contactors, terminal strips, bus bars, labels, voltage comparators, phase failure and sequence detection relays, timers, wiring, mechanical key interlocking etc. The board shall make provision for 30% additional space for future requirements.	Sum	1	
21,3	Special Labels			
21.3.1	Supply and install special labels in accordance with SANS 10142-1 and associated safety regulations to each section of the AC/DC distribution panel warning against various supplies entering the board, various voltages in the board and the automatic change over supply which must be isolated when work needs to do in the board or on any supply. All other control panel shall be clearly labelled as well. Labels must also be secured to the outside covers of plugs and light switches. All labels shall comply with the relevant specification.	Sum	1	

22,0	BATTERY CABINET, BATTERY CHARGER AND BATTERIES			
	See specification BBB2502, BBB 5452			
22,1	110V DC Battery Charger			
22,1	Tiov Do Battery Charger			
22.1.1	Supply and install a 230V AC to 110V DC, 30A battery charger.	Each	1	
22.2	440V DC Bettem Penk			
22,2	110V DC Battery Bank			
22.2.1	Supply and install 110V DC, 200Ah, 53 maintenance-free gel batteries	Sum	1	
22,3	Battery Stand			
22.3.1	Supply and install a rigid battery bank stand capable of supporting the entire battery bank and also allows for 360-degree access to the battery bank for ease of maintenance.	Each	1	
23,0	TELECONTROL OUTSTATION			
20,0	See specification BBC0653			
	<u>l</u>			
23,1	Supply and install a cabinet SIS500 outstation to be floor mounted.	Each	1	
	Supply and install a			
23,2	communication panel to link the SIS500 outstation to optic fibre backbone for Telecontrol complete with a fibre optic modem multiplexer, patch panel and power supply. The cabinet to be mounted on top of the SIS500 outstation.	Sum	1	

23,3	Meanwell 110V – 24V DC – DC converter installed inside	Each	1	
23,4	Logic Rack with 1 X PSU card	Each	1	
23,5	Logic Rack with DO cards	Each	2	
23,6	Logic Rack with DI cards	Each	3	
23,7	Logic Rack with LMCU Digital card	Each	1	
23,8	Logic Rack with Pulse Rail Cards	Each	1	
23,9	Logic Rack with Latch Rail Cards	Each	12	
23.10	Logic Rack with Digital input Rail Cards	Each	48	
23.11	Logic Rack with IO Cables 40cm long	Each	10	
23.12	Logic Rack with RS232 cable	Each	3	

23.13	Logic Rack with Common negative return cable	Each	3	
24,3	DC Luminaires Indoor Lighting			
24.3.1	Supply and install 65W, 110V DC LED luminaire suspended 1m below roof ceiling.	Each	2	
24,4	Light Switches			
24.4.1	Supply and install surface mounted single lever two-way light switch complete with cover box and cover plated.	Each	2	
24.4.2	Supply and install surface mounted single lever one-way light switch complete with cover box and cover plated.	Each	1	
24.4.3	Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover plate.	Each	1	
24.4.5	Supply and install surface mounted DC rated single lever one-way light switch complete with cover box and cover plated.	Each	1	
24,5	Wire Ways and Galvanised Steel Tubing			
24.5.1	Supply and install metal trunking complete with clip-in cover plates, splices, elbows, tees, end caps and other accessories.	Sum	1	

24.5.2	Supply and install 20mm galvanised steel tubing complete with fittings, couplings, inspection boxes, covers and sets as required.	Sum	1	
24.5.3	Supply and install standard adapters to support LED light fittings onto the trunking. Two per light fitting. Supply and install steel wire cable and suitable insulated brackets to	Sum	1	
	suspend trunking from the substation roof. Brackets shall be insulated from earth potential.			
24.5.4	Supply and install PVC insulated wire for lights and switched socket outlets circuits (red, white, blue, black and grey). Wire to be SANS approved.	Sum	1	
24,6	AC Distribution Box			
24,0	AC DISTIBUTION BOX			
24.6.1	Supply and install surface mounted industrial type AC distribution board. The board to be powder coated Eau-de-nil.	Sum	1	
24.7	DC Distribution Box			
24,7	DO DISHIBULION BOX			
24.7.1	Supply and install surface mounted industrial type DC distribution board. The board to be powder coated Eau-de-nil.	Sum	1	
24,8	LV Cables			
2-7,0	LT JUDIOS			

24.8.1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	Sum	1		
25,0	COOLING AND VENTILATION				
25,1	Substation Fresh Air Supply				
25,1	Substation Fresh Air Supply				
25.1.1	Supply and install a fresh air supply fan consisting of two fans with a combined rating of 2.7m <sup>3</sup> /s at 150Pa.	Each	1		
25,2	Thermostat Control Switch				
25.2.1	Supply and install a thermostat control switch. The thermostat control switch shall operate the two fresh air supply fans through a contactor installed in an AC/DC distribution panel. The position of the thermostat shall be determined on site.	Each	1		
25,3	Battery Room Extractor Fan				
·	-		I	I	
25.3.1	Supply and install a battery room extractor fan with local isolator rated for 0.2m³/s at 25Pa. The fan shall be appropriate for the zone location.	Each	1		
25,4	Toilet Extractor Fan				
20,4	I OHEL EXITACION FAIN				

25.4.1	Supply and install the toilet extractor fan rated from 0.035m³/s. The rate shall include a delay timer for the fan which will be connected to the toilet light circuit.	Each	1		
26,0	INDOOR EARTHING				
26,1	Supply and install indoor earthing according to drawing CEE-TBD-7.	Sum	1		
			1	ı	
26,2	DC Earth Leakage Relay				
			1	Г	ı
26.2.1	Supply and install DC earth leakage relay. The rate shall include zoning for earth fault locations.	Each	1		
26,3	Cable Earth Fault Relay				
26.3.1	Supply and install cable earth faulty indication relay.	Each	1		
27,0	NEGATIVE RETURN MONITORING SYSTEM				
	See specifications BBC1843 and BBC1844				
			1	Г	ı
27,1	Supply and install a negative return monitoring system complete.	Each	1		
28,0	FIRE FIGHTING				
28,1	Fire Risk Assessment				
28.1.1	Conduct a fire risk assessment and provide a report with recommendations.	Sum	1		
28,2	Fire Fighting Equipment				

28.2.1	Design, supply and install firefighting equipment as per the accepted recommendations of the fire risk assessment.	Sum	1	
29,0	SECURITY SYSTEM			
29,1	Design, supply and install the security system complete with access control, vehicle registration identification, perimeter intruder detection system, CCTV cameras (2x Type 1 and 8x Type 4), IP cameras and electric fence.	Sum	1	
29,2	Supply and install the complete support structure for the outdoor cameras	Sum	1	
30,0	WARNING NOTICES AND SIGNS			
30,1	Supply and install a complete set of warning notices and signs as per the specifications.	Sum	1	
	OUNDRIES			
31,0	SUNDRIES Sundries to be determined by Contractor			
31,1	Supply and install sundries as determined	Sum	1	
	DECOMISSIONING AND			
32,0	DEMOLITION			
32,1	DECOMISSIONING			
32.1.1	Decommissioning of existing equipment. The rate to including transportation to a storage facility at Driehoek store including non- ferrous metals (i.e., cable conductors, etc.)	Sum	1	

32.1.2	Conduct an oil test for PCB on all the electrical equipment with oil insulation.	Sum	1	
32.1.3	Handling and disposal of oil containing PCB.			
32.1.4	Dismantling and disposal of hazardous and non-re-usable material (i.e., asbestos) to an environmentally approved disposal site.	Sum	1	
22.2	DEMOLITION.			
33,2	DEMOLITION			
33.2.1	Demolish the existing transformer plinth and all damaged concrete platforms. The rate shall include removal and transportation of rubble to an environmentally approved dumping site.	Sum	1	
34,0	TRAINING			
34,1	Provide training on all substation equipment installed. The rate shall include theoretical training in a classroom setting and practical training on site. Allow for at least 6 Technicians, 2 Supervisors and 1 Technical manager.	Sum	1	
35,0	MANUALS AND DATA PACK			

Provide 3 sets of detailed operating and maintenance instructions of all equipment, switchgear relays, transformers, and other electrical equipment. Hard copies and electronic format on CD/Memory Stick.	set of 3	1		
TEST AND COMMISSIONING				
Factory Acceptance Test				
Allow for factory functional tests to be conducted by the manufacturers of all the equipment at their premises.	Sum	1		
Site Acceptance Test				
Allow for functional equipment testing on site.	Sum	1		
Cold Commissioning				
Allow for functional testing on all equipment (primary and secondary plant) and circuitry to prove proper functioning and installation thereof.	Sum	1		
Hot Commissioning				
Allow for functional testing to prove the satisfactory operation of all equipment under live conditions.	Sum	1		
TEMPORARY WORKS				
	operating and maintenance instructions of all equipment, switchgear relays, transformers, and other electrical equipment. Hard copies and electronic format on CD/Memory Stick.  TEST AND COMMISSIONING  Factory Acceptance Test  Allow for factory functional tests to be conducted by the manufacturers of all the equipment at their premises.  Site Acceptance Test  Allow for functional equipment testing on site.  Cold Commissioning  Allow for functional testing on all equipment (primary and secondary plant) and circuitry to prove proper functioning and installation thereof.  Hot Commissioning  Allow for functional testing to prove the satisfactory operation of all equipment under live conditions.	operating and maintenance instructions of all equipment, switchgear relays, transformers, and other electrical equipment. Hard copies and electronic format on CD/Memory Stick.  TEST AND COMMISSIONING  Factory Acceptance Test  Allow for factory functional tests to be conducted by the manufacturers of all the equipment at their premises.  Site Acceptance Test  Allow for functional equipment testing on site.  Sum  Cold Commissioning  Allow for functional testing on all equipment (primary and secondary plant) and circuitry to prove proper functioning and installation thereof.  Hot Commissioning  Allow for functional testing to prove the satisfactory operation of all equipment under live conditions.  Sum	operating and maintenance instructions of all equipment, switchgear relays, transformers, and other electrical equipment. Hard copies and electronic format on CD/Memory Stick.  TEST AND COMMISSIONING  Factory Acceptance Test  Allow for factory functional tests to be conducted by the manufacturers of all the equipment at their premises.  Site Acceptance Test  Allow for functional equipment testing on site.  Cold Commissioning  Allow for functional testing on all equipment (primary and secondary plant) and circuitry to prove proper functioning and installation thereof.  Hot Commissioning  Allow for functional testing to prove the satisfactory operation of all equipment under live conditions.  Sum 1	operating and maintenance instructions of all equipment, switchgear relays, transformers, and other electrical equipment. Hard copies and electronic format on CD/Memory Stick.  TEST AND COMMISSIONING  Factory Acceptance Test  Allow for factory functional tests to be conducted by the manufacturers of all the equipment at their premises.  Site Acceptance Test  Allow for functional equipment testing on site.  Cold Commissioning  Allow for functional testing on all equipment (primary and secondary plant) and circuitry to prove proper functioning and installation thereof.  Hot Commissioning  Allow for functional testing to prove the satisfactory operation of all equipment under live conditions.  Sum 1

38,0	SPARES				
38,1	Supply a 3kV DC HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB. This shall include a fully fitted DC feeder protection relay.	Each	1		
	<u></u>		T		
38,2	Supply rectifier diodes with the same specification as the installed rectifiers.	Each	8		
			T	T	1
38,3	Supply rectifier diode monitoring card.	Each	1		
38,4	Supply rectifier attenuation circuit fuse.	Each	1		
00.5			4		
38,5	Supply rectifier fan motor.	Each	1		
38,6	Supply fan control card circuit relays and timers.	Each	1		
38,7	Supply rectifier RC ("Snubber) Circuit.	Each	5		
38,8	Supply wave filter circuit fuse.	Each	1		
38,9	Supply 110VDC under voltage monitoring relays.	Each	2		
38,10	Supply 400V AC power protection relay.	Each	2		
38,11	Supply a 65W 230V AC indoor LED luminaire lamp.	Each	1		

38,12	Supply a 65W 110V DC indoor LED luminaire lamp.	Each	1		
тот	AL FOR BILL OF QUANTITIES C		O THE SUM	MARY OF	

### STREDFORD TRACTION 3kV DC SUBSTATION (88kV Nominal Voltage - Double Units) **BILL OF QUANTITIES ELECTRICAL AND CIVIL WORKS** A bidder shall refer to the Project specification for detailed information per item Unit Rate Item Description Quantity Amount 88kV MV METAL OXIDE 1,0 **SURGE ARRESTERS** Design, supply and construct a foundation/s for an 88kV AC MV 1,1 Metal Oxide Gapless Surge set of 3 2 Arresters for an outdoor yard complete. Design, supply and construct support steel structure/s for 1,2 88kV AC Metal Oxide Gapless set of 3 2 Surge Arresters for an outdoor yard complete. Design, supply and install an 88kV AC MV Metal Oxide 1,3 2 set of 3 Gapless Surge Arresters for an outdoor yard complete with associated components. Supply cables and termination as well as protection integration of 88kV MV AC Metal Oxide 1,4 Sum Gapless Surge Arresters to each phase of medium voltage supply and substation main earth electrode/earth mat.

2,0	88kV MV AC MOTOR OPERATED DISCONNECT SWITCH			
2,1	Design, supply and construct a foundation/s for an 88kV AC Motor Operated Disconnect switch for an outdoor yard complete.	set of 3	2	
2,2	Design, supply and construct support steel structure/s for 88kV AC Motor Operated Disconnect switch for an outdoor yard complete.	set of 3	2	
2,3	Design, supply and install an 88kV AC MV Motor Operated Disconnect switch for an outdoor yard complete with associated components.	set of 3	2	
2,4	Supply cables and termination as well as protection integration of 88kV MV AC Disconnect Switch to Control Panels.	Sum	1	
3,0	88kV MV AC PRIMARY CIRCUIT BREAKER			
3,1	Design, supply and construct a foundation/s for 88kV AC Primary Circuit Breaker for an outdoor yard complete.	Each	2	
3,2	Design, supply and construct support steel structure/s for 88kV AC Primary Circuit Breaker for an outdoor yard complete.	Each	2	
3,3	Design, supply and install an 88kV AC MV Primary Circuit Breaker for the outdoor yard complete with associated components.	Each	2	

3,4	Supply cables and termination as well as protection integration of 88kV MV AC Primary Circuit Breaker to Control Panels.	Sum	1		
4,0	CURRENT TRANSFORMERS				
4,1	Design, supply and construct a foundation/s for 88kV AC Current Transformer for an outdoor yard complete.	Each	2		
4,2	Design, supply and construct support steel structure/s for 88kV AC Primary Circuit Breaker for an outdoor yard complete.	Each	2		
	T		I	Т	Т
4,3	Design, supply and install 88kV, MV Current Transformers in the set of two complete with associated components.	Set of 2	2		
			T	Γ	
4,4	Supply cable and termination as well as protection integration of 88kV MV AC Current Transformers to Control Panels.	sum	1		
5,0	6.1 MVA TRACTION TRANSFORMER				
	See specification BBB5019 and BBB8205				
5,1	Supply and install a 6.1MVA Traction Transformer with vector group determined by the designer and voltage ratio of 88kV/1.22kV/1.22kV/2.36kV complete with all the necessary ancillary equipment and material. The transformer impedance shall not be less than 8%.	Each	2		
			Γ	Т	Г
6,0	AUXILLIARY TRANSFORMERS				
	See specification BBB8204				
				-	

6,1	Design, supply and install a 100kVA, 2.36kV/400V, Dyn11, 3-phase AC, 50Hz Main Auxiliary Transformer complete.	Each	2	
6,2	Design, supply and install 88kV gapless surge arrester complete.	Each	6	
6,3	Design, supply and install a 400V, 3P, 150A, 25kA, plug-in, draw-out type circuit breaker complete.	Each	2	
6,4	Supply and install the LV circuit breaker weatherproof stainless steel enclosure box, IP55 and support galvanised steel pole complete with circuit breaker tray, gland plate, support bracket, bolts, nuts and washers.	Each	2	
7,0	See SANS 474:2006; NRS			
	057:2005			
7,1	Design, supply and install complete metering system with associated equipment's and cables	Each	2	
8,0	CONCRETE PLINTH AND BUNDWALL FOR TRANSFORMERS			
8,1	Supply and install Main Traction and Auxiliary Transformer plinth and bund wall.	Each	2	
0.0	CABLES AND BUSBARS			
9,0	See specification BBC 0198, CEE-0023.			

9,1	Supply and install suitably rated 6.6kV AC XLPE type A (three core) 25mm² copper cable complete with all the necessary termination kit to supply power to the main auxiliary transformer fed from 2.36kV of the traction transformer tertiary.	m	600	
9,2	Supply and install 110mm diameter HDPE sleeve pipes for cables crossing the railway lines.	m	500	
9,3	Supply and install 100mm <sup>2</sup> Cu, PVC insulated negative return bonds from the negative return manhole busbar to rail.	m	400	
9,4	Supply and install a negative manhole busbar with a minimum continuous rating of 4000A.	m	4	
9,5	Supply and install suitably rated 88kV AC XLPE type A (three core) 50mm2 copper cable complete with all the necessary termination kit.	m	600	
9,6	Supply and install suitably rated 6.6kV AC XLPE type B (single core) 630 mm² Aluminium cable complete with the necessary termination kit for the main 3kV DC circuit and connection to the negative bus bar inside the building.	m	600	
9,7	Supply and install 800mm <sup>2</sup> Aluminium feeder wires with associated structures, termination kit to supply power to OHTE and provision for the return cable.	m	800	

9,8	Supply and install control cables	Sum	1	
9,9	Supply and install suitably rated (100x10mm) rigid flat copper bus bars (2 parallel bus bars per phase arrangement) between the secondary winding of the traction transformer and the wall bushings, complete with flexible removable connections to avoid overstressing of connections and insulators. The bus bars shall also be for the interconnection between the wall bushings and the rectifier (2 parallel bus bars per phase arrangement), from the rectifier to the reactor and to the positive isolator for the main positive bus bar on the wave filter equipment. The bus bar shall also include the negative return circuit and wall insulators. Bus bars shall be colour coded and to be SANS approved.	m	400	
10,0	TRACTION SUBSTAITION BUILDING AND ASSOCIATED EQUIPMENT			
			I	
10,1	1. Refurbish substation building/s and associated structures with vandal-proof doors. 2. Supply and deliver wooden room for Security guardroom as per section 4.1.5	Sum	1	
10,2	Associated Equipment			
10,2	Associated Equipment			
10.2.1	Supply a self-supporting aluminium ladder with a height not exceeding 1.5m.	Each	1	
10.2.2	Supply and mount against the wall a key box with a lid and make provision for at least 15 keys.	Each	1	

Supply and install suitable brackets for storing the ladder, special tools and earthing apparatus, and also brackets on the wall immediately adjacent to the annex door for mounting of fire extinguishers.	Sum	1		
Supply a steel cabinet/desk combination approximately 1150mm wide, 600mm deep and 1200mm high.	Each	1		
Supply and mount on the wall above the desk an A1 size picture frame with transparent cover.	Each	1		
Toilet Facility				
Design, supply and construct complete unisex toilet with associated accessories and connect sewer pipe to municipalities main network.	Sum	1		
<u> </u>				
FENCING, GATES AND KERBING				
Welded Mesh Fence and Gates				
Supply and install a 1.8m welded mesh fence complete.	m^2	120		
Supply and install a 1.8m welded mesh fence gate	Each	1		
complete.				
	brackets for storing the ladder, special tools and earthing apparatus, and also brackets on the wall immediately adjacent to the annex door for mounting of fire extinguishers.  Supply a steel cabinet/desk combination approximately 1150mm wide, 600mm deep and 1200mm high.  Supply and mount on the wall above the desk an A1 size picture frame with transparent cover.  Toilet Facility  Design, supply and construct complete unisex toilet with associated accessories and connect sewer pipe to municipalities main network.  FENCING, GATES AND KERBING  Welded Mesh Fence and Gates  Supply and install a 1.8m welded mesh fence complete.	brackets for storing the ladder, special tools and earthing apparatus, and also brackets on the wall immediately adjacent to the annex door for mounting of fire extinguishers.  Supply a steel cabinet/desk combination approximately 1150mm wide, 600mm deep and 1200mm high.  Supply and mount on the wall above the desk an A1 size picture frame with transparent cover.  Toilet Facility  Design, supply and construct complete unisex toilet with associated accessories and connect sewer pipe to municipalities main network.  FENCING, GATES AND KERBING  Welded Mesh Fence and Gates  Supply and install a 1.8m welded mesh fence complete.  M^2  Supply and install a 1.8m  welded mesh fence complete.	brackets for storing the ladder, special tools and earthing apparatus, and also brackets on the wall immediately adjacent to the annex door for mounting of fire extinguishers.  Supply a steel cabinet/desk combination approximately 1150mm wide, 600mm deep and 1200mm high.  Supply and mount on the wall above the desk an A1 size picture frame with transparent cover.  Toilet Facility  Design, supply and construct complete unisex toilet with associated accessories and connect sewer pipe to municipalities main network.  FENCING, GATES AND KERBING  Welded Mesh Fence and Gates  Supply and install a 1.8m welded mesh fence complete.  May 1 1	brackets for storing the ladder, special tools and earthing apparatus, and also brackets on the wall immediately adjacent to the annex door for mounting of fire extinguishers.  Supply a steel cabinet/desk combination approximately 1150mm wide, 600mm deep and 1200mm high.  Supply and mount on the wall above the desk an A1 size picture frame with transparent cover.  Toilet Facility  Design, supply and construct complete unisex toilet with associated accessories and connect sewer pipe to municipalities main network.  FENCING, GATES AND KERBING  Welded Mesh Fence and Gates  Supply and install a 1.8m welded mesh fence complete.  Supply and install a 1.8m

11.1.4	Supply and install a 1.2m welded mesh fence gate complete.	Each	1		
12,0	EXCAVATION, BACKFILLING AND COMPACTION				
	See Specification CEE-0023				
12,1	Platform				
12.1.1	Excavate existing ground to prepare insitu layer and compact. Supply and compact final layer G5 material and backfill foundation trenches	m³	50		
12,2	Cables and Earthing				
12.2.1	Excavations for trenches in soil, importation of soil as per specification to bed cables, backfilling of trenches, compacting with mechanical rammer.	m³	50		
13,0	OUTDOOR EARTH MAT See specification CEE-0177, BBB3059, BBB5452, BBB2721				
			T	1	
13,1	Supply and install a complete earth mat in the substation yard and also adhering to drawing no. BBB3620.	Sum	1		
13,2	Supply and install 95mm <sup>2</sup> PVC insulated stranded copper conductor to bond various equipment to the earth matt complete with copper tinned lugs. Copper conductor and lugs to be SANS approved.	Sum	1		
			•		

13,3	Supply and install anticorrosive compound such as Noxide to all crimped connections and exothermic welds	Sum	1	
13,4	Allow a rate to braze or exothermic weld all the below ground connections	sum	1	
13,5	Supply and install Malthoid or any approved insulation material to insulate the main traction transformer from concrete plinth.	Sum	1	
13,6	Supply and install copper earth rods of 1.5m in length, which are suitably threaded to each end complete with a coupling and two brass rod termination clamps. Earth rods to be installed as per drawing BBB 3620. Earth rods not to be less than 70mm <sup>2</sup> copper in accordance with SANS1063.	Sum	1	
13,7	Supply and install braded copper bonds on all gates. Bonds shall be painted silver. Wire size bonds shall be the equivalent of 95mm² copper conductor.	Sum	1	
13,8	Supply and install AC earth leakage current transformer	Each	4	
			<u> </u>	
13,9	Supply and install a weatherproof stainless-steel enclosure in which to house the AC earth leakage current transformer complete with the mounting required	Each	4	
			I	

13,10	Supply and install environmentally approved weed killer and then a 100mm layer of crusher stone	m²	1000	
14,0	ANODE WALL PLATE AND BUSHINGS			
14,1	Supply and install a hot dip galvanised Anode Wall Plate	Set	1	
14,2	Supply and install suitably rated	Each	6	
	wall bushings			
	YARD LIGHTING			
15,0				
			T	
15,1	Design, supply and install 400 W outdoor industrial lights with associated components including clamps, cables, fittings, protective steel cage.	Each	8	
			T	
15,2	Supply and install a solid-state type of light-sensitive control unit with an impact resistance translucent cover.	Each	1	
15,3	Design, supply and install Emergency outdoor lights supplied by solar panels.	Each	4	
15,3	3kV DC RECTIFIER See specification BBB0496,			
	BBB5452			

15.3.1	Design, supply and install a 6MW AC to DC rectifier complete with control panel and instruments, a diode monitoring panel with displays, cooling fans, attenuation circuit and associated equipment. The rectifier shall be of the 12-pulse configuration type.	Each	2		
	 			T	1
15.3.2	Design, supply and install a rectifier bay screen manufactures from 25mm woven wire type expanded metal fixed to an angle iron frame supported by square pillars complete with a bay gate and fixing material per rectifier unit. The rate to include the painting of screen, gate and pillars.	Set	2		
16,0	REACTOR COIL See specification BBB3890, BBB5452				
	,		,	<b>T</b>	
16,1	Supply and install a 1.8mH, air core reactor, complete with insulators and mounting brackets.	Each	2		
4=-					
17,0	WAVE FILTER EQUIPMENT See Specification RBB3139				
17,0	WAVE FILTER EQUIPMENT See Specification BBB3139, BBB3162, and BBB 5452				
17,0	See Specification BBB3139,				
<b>17,0</b> 17,1	See Specification BBB3139,	Each	2		
	See Specification BBB3139, BBB3162, and BBB 5452  Supply and install wave filter 1.173mH inductor coils complete with associated components and	Each	2		

Supply and install dry type wave filter 10uf capacitors complete with associated components.	Each	4		
Supply and install dry type wave filter 50uf capacitors complete with associated components.	Each	2		
Supply and install wave filter discharge 75kΩ, 150kW resistor on a suitable panel or bar complete with discharge and earthing mechanism.	Each	8		
Design, supply and install frames and support brackets for the mounting of the wave filter capacitors, inductors, resistors and associated equipment.	Each	2		
Supply and install a fuse holder mounted on insulators complete with a 100A HRC fuse to protect the wave filter equipment and isolating and earth switch.	Each	2		
3kV DC POSITIVE ISOLATOR AND UNDER VOLTAGE				
RELAY See specification BBB4724, BBB3005				
		T	T	
Supply and install positive isolator and earthing switch complete with operating mechanism situated in a metal panel complete with metering and wiring.	Each	2		
	supply and install dry type wave filter 50uf capacitors complete with associated components.  Supply and install dry type wave filter 50uf capacitors complete with associated components.  Supply and install wave filter discharge 75kΩ, 150kW resistor on a suitable panel or bar complete with discharge and earthing mechanism.  Design, supply and install frames and support brackets for the mounting of the wave filter capacitors, inductors, resistors and associated equipment.  Supply and install a fuse holder mounted on insulators complete with a 100A HRC fuse to protect the wave filter equipment and isolating and earth switch.  3kV DC POSITIVE ISOLATOR AND UNDER VOLTAGE RELAY See specification BBB4724, BBB3005  Supply and install positive isolator and earthing switch complete with operating mechanism situated in a metal panel complete with metering	Filter 10uf capacitors complete with associated components.  Supply and install dry type wave filter 50uf capacitors complete with associated components.  Supply and install wave filter discharge 75kΩ, 150kW resistor on a suitable panel or bar complete with discharge and earthing mechanism.  Each  Design, supply and install frames and support brackets for the mounting of the wave filter capacitors, inductors, resistors and associated equipment.  Supply and install a fuse holder mounted on insulators complete with a 100A HRC fuse to protect the wave filter equipment and isolating and earth switch.  Sky DC POSITIVE ISOLATOR AND UNDER VOLTAGE RELAY  See specification BBB4724, BBB3005  Supply and install positive isolator and earthing switch complete with operating mechanism situated in a metal panel complete with metering	filter 10uf capacitors complete with associated components.       Each       4         Supply and install dry type wave filter 50uf capacitors complete with associated components.       Each       2         Supply and install wave filter discharge 75kΩ, 150kW resistor on a suitable panel or bar complete with discharge and earthing mechanism.       Each       8         Design, supply and install frames and support brackets for the mounting of the wave filter capacitors, inductors, resistors and associated equipment.       Each       2         Supply and install a fuse holder mounted on insulators complete with a 100A HRC fuse to protect the wave filter equipment and isolating and earth switch.       Each       2         3kV DC POSITIVE ISOLATOR AND UNDER VOLTAGE RELAY       See specification BBB4724, BBB3005         Supply and install positive isolator and earthing switch complete with operating mechanism situated in a metal panel complete with metering       Each       2	filter 10uf capacitors complete with associated components.       Each       4         Supply and install dry type wave filter 50uf capacitors complete with associated components.       Each       2         Supply and install wave filter discharge 75kΩ, 150kW resistor on a suitable panel or bar complete with discharge and earthing mechanism.       Each       8         Design, supply and install frames and support brackets for the mounting of the wave filter capacitors, inductors, resistors and associated equipment.       Each       2         Supply and install a fuse holder mounted on insulators complete with a 100A HRC fuse to protect the wave filter equipment and isolating and earth switch.       Each       2         3kV DC POSITIVE ISOLATOR AND UNDER VOLTAGE RELAY       See specification BBB4724, BBB3005         Supply and install positive isolator and earthing switch complete with operating mechanism situated in a metal panel complete with metering       Each       2

18,2	Supply and install a 3kV DC under voltage relay as part of the low voltage control gear of the positive isolator, complete with 3kV DC voltage divider, optic fibre transmitter, optic fibre receiver and control circuitry.	Each	2	
40.0	MECHANICAL KEY			
19,0	INTERLOCKING SYSTEM			
19,1	Supply and install a mechanical key exchange system to prevent on load operation.	Set	2	
20,0	3kV DC MODULAR HIGH SPEED CIRCUIT BREAKER PANEL			
	See specification CEE-0099, CEE-0227, BBB5452			
	ALV DO History Const. I Change			
20,1	3kV DC High Speed Circuit Breaker			
20.1.1	Supply and install 3kV DC, 4000A, HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB.	Each	5	
20,2	Electronic Control Relay			
20.2.2	Supply and install an Electronic Control Relay with a 2-year warranty as per the requirements stated in clause 9.3.11 of the Scope of Works.	Each	5	
20,3	3kV DC Universal Busbar Earth Switch			

20.3.1	Supply and install a separate 3kV DC positive bus bar earth switch completes with electrical interlocking, mechanism and indication lights to be connected.	Each	2	
21,0	PRIMARY CIRCUIT CONTROL PANEL AND AC/DC DISTRIBUTION PANEL  See specification BBB2721			
	See specification bbb2/21			
21,1	Primary Circuit Breaker Control Panel			
			Γ	
21.1.1	Design, supply and install an indoor floor standing primary circuit breaker control panel complete with flag annunciator unit, protection relays (IEDs), phase failure relays, instruments meters, control equipment, event and fault recorder, indicating lights, a panel light, emergency stop button, terminal strips, bus bars, protection test blocks, wiring labels etc.	Each	2	
21,2	AC/DC Distribution Panel			

21.2.2	Design, supply and install an indoor floor standing AC/DC distribution panel complete with relays, instruments, meters, selector switches, AC and DC circuit breakers, isolators, earth switches, lightning arresters, a panel light, change over contactors, terminal strips, bus bars, labels, voltage comparators, phase failure and sequence detection relays, timers, wiring, mechanical key interlocking etc. The board shall make provision for 30% additional space for future requirements.	Each	2	
21,3	Special Labels			
			1	
21.3.1	Supply and install special labels in accordance with SANS 10142-1 and associated safety regulations to each section of the AC/DC distribution panel warning against various supplies entering the board, various voltages in the board and the automatic change over supply which must be isolated when work needs to do in the board or on any supply. All other control panel shall be clearly labelled as well. Labels must also be secured to the outside covers of plugs and light switches. All labels shall comply with the relevant specification.	Sum	1	
22,0	BATTERY CABINET, BATTERY CHARGER AND BATTERIES			
	See specification BBB2502, BBB 5452			

22,1	110V DC Battery Charger			
22.1.1	Supply and install a 230V AC to 110V DC, 30A battery charger.	Each	2	
22,2	110V DC Battery Bank			
22.2.1	Supply and install 110V DC, 200Ah, 53 Maintenance-free Gel batteries	Sum	2	
22,3	Battery Stand			
,				
22.3.1	Supply and install a rigid battery bank stand capable of supporting the entire battery bank and also allows for 360-degree access to the battery bank for ease of maintenance.	Each	2	
23,0	TELECONTROL OUTSTATION			
	See specification BBC0653			
23,1	Supply and install a cabinet SIS500 outstation to be floor mounted.	No	1	
23,2	Supply and install a communication panel to link the SIS500 outstation to optic fibre backbone for Telecontrol complete with a fibre optic modem multiplexer, patch panel and power supply. The cabinet to be mounted on top of the SIS500 outstation.	No	1	
23,3	Meanwell 110V – 24V DC – DC converter installed inside	Each	1	

23,4	Logic Rack with 1 X PSU card	Each	1	
23,5	Logic Rack with DO cards	Each	2	
23,6	Logic Rack with DI cards	Each	3	
23,7	Logic Rack with LMCU Digital card	Each	1	
23,8	Logic Rack with Pulse Rail Cards	Each	1	
23,9	Logic Rack with Latch Rail Cards	Each	12	
23.10	Logic Rack with Digital input Rail Cards	Each	48	
23.11	Logic Rack with IO Cables 40cm long	Each	10	
23.12	Logic Rack with RS232 cable	Each	3	
23.13	Logic Rack with Common negative return cable	Each	3	
24,3	DC Luminaires Indoor Lighting			

24.3.1	Supply and install 65W, 110V DC LED luminaire suspended 1m below roof ceiling.	Each	2	
24,4	Light Switches			
			T	Γ
24.4.1	Supply and install surface mounted single lever two-way light switch complete with cover box and cover plated.	Each	2	
				Г
24.4.2	Supply and install surface mounted single lever one-way light switch complete with cover box and cover plated.	Each	1	
24.4.3	Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover plate.	Each	1	
24.4.5	Supply and install surface mounted DC rated single lever one-way light switch complete with cover box and cover plated.	Each	1	
	-		<u> </u>	
24,5	Wire Ways and Galvanised Steel Tubing			
			<del> </del>	
24.5.1	Supply and install metal trunking complete with clip-in cover plates, splices, elbows, tees, end caps and other accessories.	Sum	1	
	,			•
24.5.2	Supply and install 20mm galvanised steel tubing complete with fittings, couplings, inspection boxes, covers and sets as required.	Sum	1	

24.5.3	Supply and install standard adapters to support LED light fittings onto the trunking. Two per light fitting. Supply and install steel wire cable and suitable insulated brackets to suspend trunking from the substation roof. Brackets shall be insulated from earth potential.	Sum	1	
24.5.4	Supply and install PVC insulated wire for lights and switched socket outlets circuits (red, white, blue, black and grey). Wire to be SANS approved.	Sum	1	
24,6	AC Distribution Box			
24,0	AO DISTRIBUTION DOX			
24.6.1	Supply and install surface mounted industrial type AC distribution board. The board to be powder coated Eau-de-nil.	Each	1	
24,7	DC Distribution Box			
24.7.1	Supply and install surface mounted industrial type DC distribution board. The board to be powder coated Eau-de-nil.	Each	1	
24,8	LV Cables			
24.8.1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	Sum	1	

	COOLING AND VENTILATION				
25,0					
	ı				
25,1	Substation Fresh Air Supply				
· · · · · · · · · · · · · · · · · · ·					
25.1.1	Supply and install a fresh air supply fan consisting of two fans with a combined rating of 2.7m <sup>3</sup> /s at 150Pa.	Each	1		
25,2	Thermostat Control Switch				
			I	T	Г
25.2.1	Supply and install a thermostat control switch. The thermostat control switch shall operate the two fresh air supply fans through a contactor installed in an AC/DC distribution panel. The position of the thermostat shall be determined on site.	Each	1		
			<u> </u>	<b>!</b>	L
25,3	Battery Room Extractor Fan				
25.3.1	Supply and install a battery room extractor fan with local isolator rated for 0.2m³/s at 25Pa. The fan shall be appropriate for the zone location.	Each	1		
25,4	Toilet Extractor Fan				
			I	T	I
25.4.1	Supply and install the toilet extractor fan rated from 0.035m³/s. The rate shall include a delay timer for the fan which will be connected to the toilet light circuit.	Each	1		
26,0	INDOOR EARTHING				

Supply and install indoor earthing according to drawing CEE-TBD-7.	Sum	1		
DC Earth Leakage Relay				
Supply and install DC earth leakage relay. The rate shall include zoning for earth fault locations.	Each	1		
Cable Earth Fault Relay				
Supply and install cable earth faulty indication relay.	Each	1		
NEGATIVE RETURN MONITORING SYSTEM				
See specifications BBC1843 and BBC1844				
Supply and install a negative return monitoring system complete.	Each	1		
FIRE FIGHTING				
Fire Risk Assessment				
Conduct a fire risk assessment and provide a report with recommendations.	Sum	1		
Fire Fighting Equipment				
Design, supply and install firefighting equipment as per the accepted recommendations of the fire risk assessment.	Sum	1		
	earthing according to drawing CEE-TBD-7.  DC Earth Leakage Relay  Supply and install DC earth leakage relay. The rate shall include zoning for earth fault locations.  Cable Earth Fault Relay  Supply and install cable earth faulty indication relay.  NEGATIVE RETURN MONITORING SYSTEM  See specifications BBC1843 and BBC1844  Supply and install a negative return monitoring system complete.  FIRE FIGHTING  Fire Risk Assessment  Conduct a fire risk assessment and provide a report with recommendations.  Fire Fighting Equipment  Design, supply and install firefighting equipment as per the accepted recommendations of	earthing according to drawing CEE-TBD-7.  DC Earth Leakage Relay  Supply and install DC earth leakage relay. The rate shall include zoning for earth fault locations.  Cable Earth Fault Relay  Supply and install cable earth faulty indication relay.  Each  NEGATIVE RETURN MONITORING SYSTEM  See specifications BBC1843 and BBC1844  Supply and install a negative return monitoring system complete.  FIRE FIGHTING  Fire Risk Assessment  Conduct a fire risk assessment and provide a report with recommendations.  Fire Fighting Equipment  Design, supply and install firefighting equipment as per the accepted recommendations of	earthing according to drawing CEE-TBD-7.  DC Earth Leakage Relay  Supply and install DC earth leakage relay. The rate shall include zoning for earth fault locations.  Cable Earth Fault Relay  Supply and install cable earth faulty indication relay.  Each  NEGATIVE RETURN MONITORING SYSTEM  See specifications BBC1843 and BBC1844  Supply and install a negative return monitoring system complete.  FIRE FIGHTING  Fire Risk Assessment  Conduct a fire risk assessment and provide a report with recommendations.  Fire Fighting Equipment  Design, supply and install firefighting equipment as per the accepted recommendations of	earthing according to drawing CEE-TBD-7.  DC Earth Leakage Relay  Supply and install DC earth leakage relay. The rate shall include zoning for earth fault locations.  Cable Earth Fault Relay  Supply and install cable earth faulty indication relay.  NEGATIVE RETURN MONITORING SYSTEM See specifications BBC1843 and BBC1844  Supply and install a negative return monitoring system complete.  FIRE FIGHTING  Fire Risk Assessment  Conduct a fire risk assessment and provide a report with recommendations.  Fire Fighting Equipment  Design, supply and install firefighting equipment as per the accepted recommendations of

29,1	Design, supply and install the security system complete with access control, vehicle registration identification, perimeter intruder detection system, CCTV cameras (2x Type 1 and 8x Type 4), IP cameras and electric fence.  Supply and install the complete support structure for the outdoor cameras	Sum	1		
			l .	l	1
30,0	WARNING NOTICES AND SIGNS				
30,1	Supply and install a complete set of warning notices and signs as per the specifications.	Sum	1		
	SUNDRIES				
31,0	Sundries to be determined by Contractor				
	Cupply and install are deleted				
31,1	Supply and install sundries as determined	Sum	1		
	DECOMISSIONING AND				
32,0	DECOMISSIONING AND DEMOLITION				
32,1	DECOMISSIONING				
32.1.1	Decommissioning of existing equipment. The rate to including transportation to a storage facility at Roodepoort Depot including non- ferrous metals (i.e., cable conductors, etc.)	Sum	1		
32.1.2	Conduct an oil test for PCB on all the electrical equipment with oil insulation.	Sum	1		
			<u> </u>	l	

32.1.3	Handling and disposal of oil containing PCB.			
32.1.4	Dismantling and disposal of hazardous and non-re-usable material (i.e., asbestos) to an environmentally approved disposal site.	Sum	1	
33,2	DEMOLITION			
33.2.1	Demolish the existing building, transformer plinth and all damaged concrete platforms. The rate shall include removal and transportation of rubble to an environmentally approved dumping site.	Sum	1	
	TRAINING			
34,0				
34,1	Provide training on all substation equipment installed. The rate shall include theoretical training in a classroom setting and practical training on site. Allow for at least 6 Technicians, 2 Supervisors and 1 Technical manager.	Sum	1	
35,0	MANUALS AND DATA PACK			
35,1	Provide 3 sets of detailed operating and maintenance instructions of all equipment, switchgear relays, transformers and other electrical equipment. Hard copies and electronic format on CD/Memory Stick.	set of 3	3	
п				
36,0	TEST AND COMMISSIONING			 

36,1	Factory Acceptance Test				
36.1.1	Allow for factory functional tests to be conducted by the manufacturers of all the equipment at their premises.	Sum	1		
36,2	Site Acceptance Test				
30,2	One Acceptance Test				
36.2.1	Allow for functional equipment testing on site.	Sum	1		
36,3	Cold Commissioning				
36.3.1	Allow for functional testing on all equipment (primary and secondary plant) and circuitry to prove proper functioning and installation thereof.	Sum	1		
36,4	Hot Commissioning				
				_	
36.4.1	Allow for functional testing to prove the satisfactory operation of all equipment under live conditions.	Sum	1		
				•	
37,0	TEMPORARY WORKS				
	I		<u> </u>	T	T
37,1	Allow for any deemed temporary works.	Sum	1		
38,0	SPARES				
55,0					

y rectifier diodes with the specification as the ed rectifiers.  y rectifier diode monitoring  y rectifier attenuation fuse.  y rectifier fan motor.	Each Each Each	1 1		
y rectifier attenuation fuse. y rectifier fan motor.	Each	1		
fuse.  y rectifier fan motor.				
	Each	1		
y fan control card circuit and timers.	Each	1		
y rectifier RC ("Snubber)	Each	5		
y wave filter circuit fuse.	Each	1		
y 110VDC under voltage oring relays.	Each	2		
y 400V AC power tion relay.	Each	2		
y a 65W 230V AC indoor uminaire lamp.	Each	1		
y a 65W 110V DC indoor uminaire lamp.	Each	1		
	y 110VDC under voltage oring relays.  y 400V AC power etion relay.  y a 65W 230V AC indoor uminaire lamp.  y a 65W 110V DC indoor uminaire lamp.	y 110VDC under voltage bring relays.  Each  y 400V AC power etion relay.  Each  y a 65W 230V AC indoor uminaire lamp.  Each  y a 65W 110V DC indoor uminaire lamp.  Each	y 110VDC under voltage pring relays.  Each 2  y 400V AC power etion relay.  Each 2  y a 65W 230V AC indoor uminaire lamp.  A a 65W 110V DC indoor uminaire lamp.  Each 1	y 110VDC under voltage bring relays.  Each 2  y 400V AC power Each 2  y a 65W 230V AC indoor uminaire lamp.  Each 1  y a 65W 110V DC indoor Each 1

#### **RESIDENSIA TIE-SUBSTATION**

### BILL OF QUANTITIES

# **ELECTRICAL AND CIVIL WORKS**

# A bidder shall refer to the Project specification for detailed information per item

Item	Description	Unit	Quantity	Rate	Amount
			•		
1,0	CABLES AND BUSBARS				
	See specification BBC 0198, CEE-0023.				
				_	
1,1	Supply and install suitably rated 6.6kV AC XLPE type A (three core) 25mm <sup>2</sup> copper cable complete with all the necessary termination kit to supply power to the main auxiliary transformer fed from 2.36kV of the traction transformer tertiary.	m	300		
				1	_
1,2	Supply and install 110mm diameter HDPE sleeve pipes for cables crossing the railway lines.	m	300		
				_	
1,3	Supply and install 100mm <sup>2</sup> Cu, PVC insulated negative return bonds from the negative return manhole busbar to rail.	m	200		
			T	T	ı
1,4	Supply and install a negative manhole busbar with a minimum continuous rating of 4000A.	Each	2		
				_	
1,5	Supply and install suitably rated 44kV AC XLPE type A (three core) 50mm2 copper cable complete with all the necessary termination kit.	m	300		
				1	
1,6	Supply and install suitably rated 6.6kV AC XLPE type B (single core) 500mm <sup>2</sup> Aluminium cable complete with the necessary termination kit for the main 3kV DC circuit and connection to the negative bus bar inside the building.	m	300		
		<u> </u>		l	<u> </u>

1,7	Supply and install 800mm <sup>2</sup> Aluminium feeder wires with associated structures, termination kit to supply power to OHTE and provision for the return cable.	m	500	
1,8	Supply and install control cables	Sum	1	
-,-			·	l
2,0	TIE-SUBSTAITION BUILDING AND ASSOCIATED EQUIPMENT			
2,1	Refurbish substation building/s and associated structures with vandal-proof doors. And design and build Security guardroom as per section 4.1.5	Sum	1	
2,2	Associated Equipment			
2.2.1	Supply a self-supporting aluminium ladder with a height not exceeding 1.5m.	Each	1	
2.2.2	Supply and mount against the wall a key box with a lid and make provision for at least 15 keys.	Each	1	
2.2.3	Supply and install suitable brackets for storing the ladder, special tools and earthing apparatus, and also brackets on the wall immediately adjacent to the annex door for mounting of fire extinguishers.	Sum	1	
2.2.4	Supply a steel cabinet/desk combination approximately 1150mm wide, 600mm deep and 1200mm high.	Each	1	
2.2.5	Supply and mount on the wall above the desk an A1 size picture frame with transparent cover.	Each	1	
3,0	FENCING, GATES, AND KERBING			

3.1	Welded Mesh Fence and Gates				
3.1.1	Supply and install a 1.8m welded mesh fence complete.	m	350		
	ı		T	T	T
3.1.2	Supply and install a 1.8m welded mesh fence gate complete.	Each	1		
242	Supply and install a 1.2m welded mesh	2	50		
3.1.3	fence complete.	m <sup>2</sup>	50		
3.1.4	Supply and install a 1.2m welded mesh	Each	1		
3.1.4	fence gate complete.	Eacii	l		
	OUTDOOR EARTH MAT				
4,0	See specification CEE-0177, BBB3059, BBB5452, BBB2721				
					1
4,1	Supply and install a complete earth mat in the substation yard and also adhering to drawing no. BBB3620.	Sum	1		
			T-	1	1
4,2	Supply and install 95mm <sup>2</sup> PVC insulated stranded copper conductor to bond various equipment to the earth mat complete with copper tinned lugs. Copper conductor and lugs to be SANS approved.	Sum	1		
				T	1
4,3	Supply and install anticorrosive compound such as Noxide to all crimped connections and exothermic welds	Sum	1		
	Ţ			1	T
4,4	Allow a rate to braze or exothermic weld all the below ground connections	Sum	1		
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4,5	Supply and install Malthoid or any approved insulation material to insulate the main traction transformer from concrete plinth.	Sum	1		

4,6	Supply and install copper earth rods of 1.5m in length, which are suitably threaded to each end complete with a coupling and two brass rod termination clamps. Earth rods to be installed as per drawing BBB 3620. Earth rods not to be less than 70mm² copper in accordance with SANS1063.	Sum	1	
4,7	Supply and install braded copper bonds on all gates. Bonds shall be painted silver. Wire size bonds shall be the equivalent of 95mm² copper conductor.	Each	sum	
4,8	Supply and install AC earth leakage current transformer	Each	2	
4,9	Supply and install a weatherproof stainless-steel enclosure in which to house the AC earth leakage current transformer complete with the mounting required	Each	2	
4,10	Supply and install environmentally approved weed killer and then a 100mm layer of crusher stone	m²	1000	
5,0	ANODE WALL PLATE AND BUSHINGS			
5,1	Supply and install a hot dip galvanised Anode Wall Plate	Set	1	
5,2	Supply and install suitably rated wall bushings	Each	6	
6,0	YARD LIGHTING			
6,1	Design, supply and install 400 W outdoor industrial lights with associated components including clamps, cables, fittings, protective steel cage.	Each	8	
6,2	Supply and install a solid-state type of light-sensitive control unit with an impact resistance translucent cover.	Each	1	 

Design, supply and install Emergency outdoor lights supplied by solar panels.	Each	4		
3kV DC MODULAR HIGH SPEED CIRCUIT BREAKER PANEL See specification CEE-0099, CEE- 0227, BBB5452				
3kV DC High Speed Circuit Breaker				
Supply and install 3kV DC, 4000A, HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB.	Each	4		
DC Feeder Protection Relay				
Supply and install a DC Feeder Protection relay with a 2-year warranty as per the requirements stated in clause 9.3.11 of the Scope of Works.	Each	4		
3kV DC Universal Busbar Earth Switch				
Supply and install a separate 3kV DC positive bus bar earth switch completes with electrical interlocking, mechanism and indication lights to be connected.	Each	1		
AC/DC DISTRIBUTION PANEL See specification BBB2721				
AC/DC Distribution Panel				
	3kV DC MODULAR HIGH SPEED CIRCUIT BREAKER PANEL See specification CEE-0099, CEE-0227, BBB5452  3kV DC High Speed Circuit Breaker  Supply and install 3kV DC, 4000A, HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB.  DC Feeder Protection Relay  Supply and install a DC Feeder Protection relay with a 2-year warranty as per the requirements stated in clause 9.3.11 of the Scope of Works.  3kV DC Universal Busbar Earth Switch  Supply and install a separate 3kV DC positive bus bar earth switch completes with electrical interlocking, mechanism and indication lights to be connected.  AC/DC DISTRIBUTION PANEL See specification BBB2721	3kV DC MODULAR HIGH SPEED CIRCUIT BREAKER PANEL  See specification CEE-0099, CEE-0227, BBB5452  3kV DC High Speed Circuit Breaker  Supply and install 3kV DC, 4000A, HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB.  DC Feeder Protection Relay  Supply and install a DC Feeder Protection relay with a 2-year warranty as per the requirements stated in clause 9.3.11 of the Scope of Works.  SkV DC Universal Busbar Earth Switch  Supply and install a separate 3kV DC positive bus bar earth switch completes with electrical interlocking, mechanism and indication lights to be connected.  AC/DC DISTRIBUTION PANEL  See specification BBB2721	3kV DC MODULAR HIGH SPEED CIRCUIT BREAKER PANEL See specification CEE-0099, CEE-0227, BBB5452  3kV DC High Speed Circuit Breaker  Supply and install 3kV DC, 4000A, HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB.  DC Feeder Protection Relay  Supply and install a DC Feeder Protection relay with a 2-year warranty as per the requirements stated in clause 9.3.11 of the Scope of Works.  Supply and install a separate 3kV DC positive bus bar earth switch completes with electrical interlocking, mechanism and indication lights to be connected.  AC/DC DISTRIBUTION PANEL See specification BBB2721	3kV DC MODULAR HIGH SPEED CIRCUIT BREAKER PANEL  See specification CEE-0099, CEE-0227, BBB5452  3kV DC High Speed Circuit Breaker  Supply and install 3kV DC, 4000A, HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB.  DC Feeder Protection Relay  Supply and install a DC Feeder Protection relay with a 2-year warranty as per the requirements stated in clause 9.3.11 of the Scope of Works.  3kV DC Universal Busbar Earth Switch  Supply and install a separate 3kV DC positive bus bar earth switch completes with electrical interlocking, mechanism and indication lights to be connected.  AC/DC DISTRIBUTION PANEL  See specification BBB2721

8.1.1	Design, supply and install an indoor floor standing AC/DC distribution panel complete with relays, instruments, meters, selector switches, AC and DC circuit breakers, isolators, earth switches, lightning arresters, a panel light, change over contactors, terminal strips, bus bars, labels, voltage comparators, phase failure and sequence detection relays, timers, wiring, mechanical key interlocking etc. The board shall make provision for 30% additional space for future requirements.	Each	1	
8,2	Special Labels			
			<u> </u>	
8.2.1	Supply and install special labels in accordance with SANS 10142-1 and associated safety regulations to each section of the AC/DC distribution panel warning against various supplies entering the board, various voltages in the board and the automatic change over supply which must be isolated when work needs to do in the board or on any supply. All other control panel shall be clearly labelled as well. Labels must also be secured to the outside covers of plugs and light switches. All labels shall comply with the relevant specification.	Sum	1	
	BATTERY CABINET, BATTERY			
9,0	CHARGER, AND BATTERIES			
0,0	See specification BBB2502, BBB 5452			
9,1	110V DC Battery Charger			
		<u> </u>		
9.1.1	Supply and install a 230V AC to 110V DC, 30A battery charger.	Each	1	
9,2	110V DC Battery Bank			
9.2.1	Supply and install 110V DC, 200Ah, 53 maintenance-free gel batteries	sum	1	
9;3	Battery Stand			
	· · · · · · · · · · · · · · · · · · ·	L		

9.3.1	Supply and install a rigid battery bank stand capable of supporting the entire battery bank and also allows for 360-degree access to the battery bank for ease of maintenance.	Each	1	
	TELECONTROL OUTSTATION	<u> </u>		
10,0	See specification BBC0653			
10.1	Supply and install a cabinet SIS500 outstation to be floor mounted.	Each	1	
10.2	Supply and install a communication panel to link the SIS500 outstation to optic fibre backbone for Telecontrol complete with a fibre optic modem multiplexer, patch panel and power supply. The cabinet to be mounted on top of the SIS500 outstation.	Each	1	
10.3	110V – 24V DC – DC converter installed inside	Each	1	
10.4	Logic Rack with 1 X PSU card	Each	1	
10.5	Logic Rack with DO cards	Each	2	
10.6	Logic Rack with DI cards	Each	3	
10.7	Logic Rack with LMCU Digital card	Each	1	
10.8	Logic Rack with Pulse Rail Cards	Each	1	

Logic Rack with Latch Rail Cards	Each	12		
Logic Rack with Digital input Rail Cards	Each	48		
Logic Rack with IO Cables 40cm long	Each	10		
Logic Rack with RS232 cable	Each	3		
Logic Rack with Common negative return cable	Each	3		
DC Luminairea Indeau Liabtina				
DC Lummaires indoor Lighting				
Supply and install 65W, 110V DC LED luminaire suspended 1m below roof ceiling.	Each	2		
Light Switches				
Light Ownones				
Supply and install surface mounted single lever two-way light switch complete with cover box and cover plated.	Each	2		
Supply and install surface mounted single lever one-way light switch complete with cover box and cover plated.	Each	1		
Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover plate.	Each	1		
	Logic Rack with Digital input Rail Cards  Logic Rack with IO Cables 40cm long  Logic Rack with RS232 cable  Logic Rack with Common negative return cable  DC Luminaires Indoor Lighting  Supply and install 65W, 110V DC LED luminaire suspended 1m below roof ceiling.  Light Switches  Supply and install surface mounted single lever two-way light switch complete with cover box and cover plated.  Supply and install surface mounted single lever one-way light switch complete with cover box and cover plated.  Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover	Logic Rack with Digital input Rail Cards  Each  Logic Rack with IO Cables 40cm long  Each  Logic Rack with RS232 cable  Each  Logic Rack with Common negative return cable  Each  DC Luminaires Indoor Lighting  Supply and install 65W, 110V DC LED luminaire suspended 1m below roof ceiling.  Light Switches  Supply and install surface mounted single lever two-way light switch complete with cover box and cover plated.  Supply and install surface mounted single lever one-way light switch complete with cover box and cover plated.  Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover box and cover box and cover lated.  Each  Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover	Logic Rack with Digital input Rail Cards  Logic Rack with IO Cables 40cm long  Each  Logic Rack with RS232 cable  Each  3  Logic Rack with RS232 cable  Each  3  DC Luminaires Indoor Lighting  Supply and install 65W, 110V DC LED luminaire suspended 1m below roof celling.  Light Switches  Supply and install surface mounted single lever two-way light switch complete with cover box and cover plated.  Supply and install surface mounted single lever one-way light switch complete with cover box and cover plated.  Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover plated.  Each  1  Light Switches  Each  2  Supply and install surface mounted single lever one-way light switch complete with cover box and cover plated.	Logic Rack with Digital input Rail  Logic Rack with IO Cables 40cm long  Each  Logic Rack with RS232 cable  Each  Logic Rack with Common negative return cable  Each  3  Logic Rack with Common negative return cable  Each  3  DC Luminaires Indoor Lighting  Supply and install 65W, 110V DC LED luminaire suspended 1m below roof ceiling.  Light Switches  Supply and install surface mounted single lever two-way light switch complete with cover box and cover plated.  Supply and install surface mounted single lever one-way light switch complete with cover box and cover plated.  Each  1  Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover

12.4	Supply and install surface mounted DC rated single lever one-way light switch complete with cover box and cover plated.	Each	1	
40.5	Wire Ways and Galvanised Steel			
12,5	Tubing			
12.5.1	Supply and install metal trunking complete with clip-in cover plates, splices, elbows, tees, end caps and other accessories.	sum	1	
12.5.2	Supply and install 20mm galvanised steel tubing complete with fittings, couplings, inspection boxes, covers and sets as required.	sum	1	
12.5.3	Supply and install standard adapters to support LED light fittings onto the trunking. Two per light fitting. Supply and install steel wire cable and suitable insulated brackets to suspend trunking from the substation roof. Brackets shall be insulated from earth potential.	sum	1	
12.5.4	Supply and install PVC insulated wire for lights and switched socket outlets circuits (red, white, blue, black and grey). Wire to be SANS approved.	sum	1	
40.0	AC Distribution Don			
12,6	AC Distribution Box			
12.6.1	Supply and install surface mounted industrial type AC distribution board. The board to be powder coated Eaude-nil.	Each	1	
12,7	DC Distribution Box			
12,1	DO DISTRIBUTION BOX			
12.7.1	Supply and install surface mounted industrial type DC distribution board. The board to be powder coated Eaude-nil.	Each	1	
12,8	LV Cables			
12,0	LY CUNIES			
L				

12.8.1	PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	sum	1	
13,0	COOLING AND VENTILATION			
13,0				
13,1	Substation Fresh Air Supply			
			Γ	
13.1.1	Supply and install a fresh air supply fan consisting of two fans with a combined rating of 2.7m <sup>3</sup> /s at 150Pa.	Each	1	
13,2	Thermostat Control Switch			
10,2	The intercent Control Control			
13.2.1	Supply and install a thermostat control switch. The thermostat control switch shall operate the two fresh air supply fans through a contactor installed in an AC/DC distribution panel. The position of the thermostat shall be determined on site.	Each	1	
13,3	Battery Room Extractor Fan			
13,3	Dattery Room Extractor Fair			
13.3.1	Supply and install a battery room extractor fan with local isolator rated for 0.2m³/s at 25Pa. The fan shall be appropriate for the zone location.	Each	1	
	INDOOR EARTHING			
14,0	INDOOR EARTHMO			
14,1	Supply and install indoor earthing according to drawing CEE-TBD-7.	sum	1	
14,2	DC Earth Leakage Relay			
14.2.1	Supply and install DC earth leakage relay. The rate shall include zoning for earth fault locations.	Each	1	
14,3	Cable Earth Fault Relay			
1-1,0	Canto Editir i dale Molay			

	Supply and install cable corth faulty			Í	1
14.3.1	Supply and install cable earth faulty indication relay.	Each	1		
	NEGATIVE RETURN MONITORING				
15,0	SYSTEM				
.0,0	See specifications BBC1843 and BBC1844				
15,1	Supply and install a negative return monitoring system complete.	Each	1		
16,0	FIRE FIGHTING				
16,1	Fire Risk Assessment				
				1	
16.1.1	Conduct a fire risk assessment and provide a report with recommendations.	sum	1		
16,2	Fire Fighting Equipment				
10,2					
16.2.1	Design, supply and install firefighting equipment as per the accepted recommendations of the fire risk assessment.	sum	1		
	CECUDITY CVCTEM				
17,0	SECURITY SYSTEM				
17,1	Design, supply and install the security system complete with access control, vehicle registration identification, perimeter intruder detection system, CCTV cameras (2x Type 1 and 8x Type 4), IP cameras and electric fence.	sum	1		
	Supply and install the complete support				
17,2	structure for the outdoor cameras	sum	1		
	Supply and install CCTV remetals				<u> </u>
17,3	Supply and install CCTV remotely monitoring and control system and associated components at Robinson Station	sum	1		
40.0	WARNING NOTICES AND SIGNS				
18,0					

18,1	Supply and install a complete set of warning notices and signs as per the specifications.	sum	1		
	SUNDRIES				
19,0	Sundries to be determined by Contractor				
19,1	Supply and install sundries as determined	sum	1		
20,0	DECOMISSIONING AND DEMOLITION				
20,1	DECOMISSIONING				
				1	
20.1.1	Decommissioning of existing equipment. The rate to including transportation to a storage facility at Roodepoort Depot including nonferrous metals (i.e., cable conductors, etc.)	sum	1		
	1				
20.1.2	Conduct an oil test for PCB on all the electrical equipment with oil insulation.	sum	1		
			Г	T	
20.1.3	Handling and disposal of oil containing PCB.				
20.1.4	Dismantling and disposal of hazardous and non-re-usable material (i.e., asbestos) to an environmentally approved disposal site.	sum	1		
22.2					
20,2	DEMOLITION				
20.2.1	Demolish the existing building, all damaged concrete platforms. The rate shall include removal and transportation of rubble to an environmentally approved dumping site.	sum	1		
	TRAINING				
21,0	INAMING				

21,1	Provide training on all substation equipment installed. The rate shall include theoretical training in a classroom setting and practical training on site. Allow for at least 6 Technicians, 2 Supervisors and 1 Technical manager.	sum	1		
	MANUALS AND DATA PACK				
22,0					
			T	1	T
22,2	Provide 3 sets of detailed operating and maintenance instructions of all equipment, switchgear relays, transformers and other electrical equipment. Hard copies and electronic format on CD/Memory Stick.	set of 3	3		
	TECT AND COMMISSIONING				
23,0	TEST AND COMMISSIONING				
23,1	Factory Acceptance Test				
			1	1	
23.1.1	Allow for factory functional tests to be conducted by the manufacturers of all the equipment at their premises.	sum	1		
23,2	Site Acceptance Test				
23.2.1	Allow for functional equipment testing on site.	sum	1		
23,3	Cold Commissioning				
20,0	CO.C. Commodicining				
23.3.1	Allow for functional testing on all equipment (primary and secondary plant) and circuitry to prove proper functioning and installation thereof.	sum	1		
23,4	Hot Commissioning				
_0,7					
23.4.1	Allow for functional testing to prove the satisfactory operation of all equipment under live conditions.	sum	1		
	TEMPORARY WORKS				
24,0	I LIVIT ONAN'I WORKS				
		I			

24,1	Allow for any deemed temporary works.	sum	1				
25,0	SPARES						
25,1	Supply a 3kV DC HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB. This shall include a fully fitted DC feeder protection relay.	Each	1				
25,2	Supply 110VDC under voltage monitoring relays.	Each	2				
25,3	Supply 400V AC power protection relay.	Each	2				
25,4	Supply a 65W 230V AC indoor LED luminaire lamp.	Each	1				
25,5	Supply a 65W 110V DC indoor LED luminaire lamp.	Each	1				
7	TOTAL FOR BILL OF QUANTITIES CARRIED TO THE SUMMARY OF PRICES						
					<u> </u>		

# HOUTHEUWEL TRACTION 3kV DC SUBSTATION (88kV Nominal Voltage - Single Unit)

# BILL OF QUANTITIES

### **ELECTRICAL AND CIVIL WORKS**

A bidder shall refer to the Project specification for detailed information per item							
Item	Description	Unit	Quantity	Rate	Amount		
1,0	88kV HV METAL OXIDE SURGE ARRESTERS						
1,1	Design, supply and construct a foundation/s for an 88kV AC HV Metal Oxide Gapless Surge Arresters for an outdoor yard complete.	set of 3	1				
1,2	Design, supply and construct support steel structure/s for 88kV AC Metal Oxide Gapless Surge Arresters for an outdoor yard complete.	set of 3	1				
1,3	Design, supply and install an 88kV AC HV Metal Oxide Gapless Surge Arresters for an outdoor yard complete with associated components.	set of 3	1				
1,4	Supply cables and termination as well as protection integration of 88kV HV AC Metal Oxide Gapless Surge Arresters to each phase of medium voltage supply and substation main earth electrode/earth mat.	Sum	1				
2,0	88kV HV AC MOTOR OPERATED DISCONNECT SWITCH						
2,1	Design, supply and construct a foundation/s for an 88kV AC Motor Operated Disconnect switch for an outdoor yard complete.	set of 3	1				

esign, supply and install an BkV AC HV Motor Operated isconnect switch for an utdoor yard complete with esociated components.  upply cables and termination is well as protection integration if 88kV HV AC Disconnect witch to Control Panels.	set of 3	1		
s well as protection integration 88kV HV AC Disconnect witch to Control Panels.	Sum	1		
CIRCUIT BREAKER				
esign, supply and construct a bundation/s for 88kV AC rimary Circuit Breaker for an utdoor yard complete.	Each	1		
esign, supply and construct upport steel structure/s for BkV AC Primary Circuit reaker for an outdoor yard omplete.	Each	1		
			•	
esign, supply and install an BkV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.	Each	1		
upply cables and termination s well as protection integration 88kV HV AC Primary Circuit reaker to Control Panels.	Sum	1		
CURRENT TRANSFORMERS				
or e e e e e e e e e e e e e e e e e e e	esign, supply and construct a undation/s for 88kV AC rimary Circuit Breaker for an utdoor yard complete.  esign, supply and construct upport steel structure/s for 8kV AC Primary Circuit reaker for an outdoor yard omplete.  esign, supply and install an 8kV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.	esign, supply and construct a undation/s for 88kV AC rimary Circuit Breaker for an utdoor yard complete.  Each esign, supply and construct upport steel structure/s for 8kV AC Primary Circuit reaker for an outdoor yard omplete.  Each esign, supply and install an 8kV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.  Each esign, supply and install an 8kV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.  Each esign, supply and install an 8kV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.  Each esign, supply and install an 8kV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.  Each esign, supply and install an 8kV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.  Each esign, supply and construct reaker for an outdoor yard omplete.	esign, supply and construct a undation/s for 88kV AC rimary Circuit Breaker for an atdoor yard complete.  esign, supply and construct apport steel structure/s for 3kV AC Primary Circuit reaker for an outdoor yard omplete.  esign, supply and install an 3kV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.  Each 1  Each 1	esign, supply and construct a undation/s for 88kV AC rimary Circuit Breaker for an utdoor yard complete.  esign, supply and construct apport steel structure/s for 3kV AC Primary Circuit reaker for an outdoor yard omplete.  esign, supply and install an 3kV AC HV Primary Circuit reaker for the outdoor yard omplete with associated omponents.  Each 1  Each 1

Design, supply and construct a foundation/s for 88kV AC Current Transformer for an outdoor yard complete.	sum	1		
Design, supply and install 88kV, HV Current Transformers in the set of two complete with associated components.	Set of 3	1		
,				
Supply cable and termination as well as protection integration of 88kV HV AC Current Transformers to Control Panels.	sum	1		
6.1 MVA TRACTION TRANSFORMER				
See specification BBB5019 and BBB8205	_			
			T	
Supply and install a 6.1MVA Traction Transformer with vector group determined by the designer and voltage ratio of 88kV/1.22kV/1.22kV/2.36kV complete with all the necessary ancillary equipment and material. The transformer impedance shall not be less than 8%.	Each	1		
			,	
AUXILLIARY TRANSFORMERS				
See specification BBB8204				
			1	
Design, supply and install a 100kVA, 2.36kV/400V, Dyn11, 3-phase AC, 50Hz Main Auxiliary Transformer complete.	Each	1		
			1	T
Design, supply and install 88kV gapless surge arrester complete.	Each	3		
	foundation/s for 88kV AC Current Transformer for an outdoor yard complete.  Design, supply and install 88kV, HV Current Transformers in the set of two complete with associated components.  Supply cable and termination as well as protection integration of 88kV HV AC Current Transformers to Control Panels.  6.1 MVA TRACTION TRANSFORMER  See specification BBB5019 and BBB8205  Supply and install a 6.1MVA Traction Transformer with vector group determined by the designer and voltage ratio of 88kV/1.22kV/1.22kV/2.36kV complete with all the necessary ancillary equipment and material. The transformer impedance shall not be less than 8%.  AUXILLIARY TRANSFORMERS See specification BBB8204  Design, supply and install a 100kVA, 2.36kV/400V, Dyn11, 3-phase AC, 50Hz Main Auxiliary Transformer complete.  Design, supply and install 88kV	foundation/s for 88kV AC Current Transformer for an outdoor yard complete.  Design, supply and install 88kV, HV Current Transformers in the set of two complete with associated components.  Supply cable and termination as well as protection integration of 88kV HV AC Current Transformers to Control Panels.  6.1 MVA TRACTION TRANSFORMER  See specification BBB5019 and BB8205  Supply and install a 6.1MVA Traction Transformer with vector group determined by the designer and voltage ratio of 88kV/1.22kV/1.22kV/2.36kV complete with all the necessary ancillary equipment and material. The transformer impedance shall not be less than 8%.  AUXILLIARY TRANSFORMERS  See specification BBB8204  Design, supply and install a 100kVA, 2.36kV/400V, Dyn11, 3-phase AC, 50Hz Main Auxiliary Transformer complete.  Design, supply and install 88kV	foundation/s for 88kV AC Current Transformer for an outdoor yard complete.  Design, supply and install 88kV, HV Current Transformers in the set of two complete with associated components.  Supply cable and termination as well as protection integration of 88kV HV AC Current Transformers to Control Panels.  6.1 MVA TRACTION TRANSFORMER  See specification BBB5019 and BBB8205  Supply and install a 6.1MVA Traction Transformer with vector group determined by the designer and voltage ratio of 88kV/1.22kV/1.22kV/2.36kV complete with all the necessary ancillary equipment and material. The transformer impedance shall not be less than 8%.  AUXILLIARY TRANSFORMERS  See specification BBB8204  Design, supply and install a 100kVA, 2.36kV/400V, Dyn11, 3-phase AC, 50Hz Main Auxiliary Transformer complete.  Design, supply and install 88kV	foundation/s for 88kV AC Current Transformer for an outdoor yard complete.  Design, supply and install 88kV, HV Current Transformers in the set of two complete with associated components.  Supply cable and termination as well as protection integration of 88kV HV AC Current Transformers to Control Panels.  6.1 MVA TRACTION TRANSFORMER  See specification BBB5019 and BBB8205  Supply and install a 6.1MVA Traction Transformer with vector group determined by the designer and voltage ratio of 88kV/1.22kV/1.22kV/2.36kV complete with all the necessary ancillary equipment and material. The transformer impedance shall not be less than 8%.  AUXILLIARY TRANSFORMERS See specification BBB8204  Design, supply and install a 100kVA, 2.36kV/400V, Dyn11, 3-phase AC, 50Hz Main Auxiliary Transformer complete.  Design, supply and install 88kV

6,3	Design, supply and install a 400V, 3P, 150A, 25kA, plug-in, draw-out type circuit breaker complete.	Each	1	
			<del>.</del>	
6,4	Supply and install the LV circuit breaker weatherproof stainless steel enclosure box, IP55 and support galvanised steel pole complete with circuit breaker tray, gland plate, support bracket, bolts, nuts and washers.	Each	1	
7,0	See SANS 474:2006; NRS 057:2005			
	, , , , , , , , , , , , , , , , , , ,		<del>                                     </del>	
7,1	Design, supply and install complete metering system with associated equipment and cables	Sum	1	
8,0	CONCRETE PLINTH AND BUNDWALL FOR TRANSFORMERS			
8,1	Supply and install Main Traction and Auxiliary Transformer plinth and bund wall.	Each	1	
9,0	CABLES AND BUSBARS See specification BBC 0198, CEE-0023.			
			<del>                                     </del>	
9,1	Supply and install suitably rated 6.6kV AC XLPE type A (three core) 25mm² copper cable complete with all the necessary termination kit to supply power to the main auxiliary transformer fed from 2.36kV of the traction transformer tertiary.	М	300	
	<u> </u>			1

9,2	Supply and install 110mm diameter HDPE sleeve pipes for cables crossing the railway lines.	m	500	
9,3	Supply and install 100mm <sup>2</sup> Cu, PVC insulated negative return bonds from the negative return manhole busbar to rail.	m	200	
9,4	Supply and install a negative manhole busbar with a minimum continuous rating of 4000A.	m	2	
9,5	Supply and install suitably rated 88kV AC XLPE type A (three core) 50mm2 copper cable complete with all the necessary termination kit.	m	300	
9,6	Supply and install suitably rated 6.6kV/11kV AC XLPE type B (single core) 630mm <sup>2</sup> Aluminium cable complete with the necessary termination kit for the main 3kV DC circuit and connection to the negative bus bar inside the building.	m	600	
9,7	Supply and install 800mm <sup>2</sup> Aluminium feeder wires with associated structures, termination kit to supply power to OHTE and provision for the return cable.	m	500	
9,8	Supply and install control cables	sum	1	



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9,9	Supply and install suitably rated (100x10mm) rigid flat copper bus bars (2 parallel bus bars per phase arrangement) between the secondary winding of the traction transformer and the wall bushings, complete with flexible removable connections to avoid overstressing of connections and insulators. The bus bars shall also be for the interconnection between the wall bushings and the rectifier (2 parallel bus bars per phase arrangement), from the rectifier to the reactor and to the positive isolator for the main positive bus bar on the wave filter equipment. The bus bar shall also include the negative return circuit and wall insulators. Bus bars shall be colour coded and to be SANS approved.	m	200	
10,0	TRACTION SUBSTAITION BUILDING AND ASSOCIATED EQUIPMENT			
10,1	Refurbish substation building/s and associated structures with vandal-proof doors. And design and build Security guardroom as per section 4.1.5	sum	1	
10,2	Associated Equipment			
10.2.1	Supply a self-supporting aluminium ladder with a height not exceeding 1.5m.	Each	1	
10.2.2	Supply and mount against the wall a key box with a lid and make provision for at least 15 keys.	Each	1	
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	<u> </u>	<u> </u>	1	1	L
11.1.2	Supply and install a 1.8m welded mesh fence gate complete.	Each	1		
11.1.1	Supply and install a 1.8m welded mesh fence complete.	m	350		
11,1	Welded Mesh Fence and Gates				
11,0	FENCING, GATES AND KERBING				
10.3.1	Design, supply and construct complete unisex toilet with associated accessories and connect sewer pipe to municipalities main network.	sum	1		
10,3	Toilet Facility		1		
10.2.5	Supply and mount on the wall above the desk an A1 size picture frame with transparent cover.	Each	1		
10.2.4	Supply a steel cabinet/desk combination approximately 1150mm wide, 600mm deep and 1200mm high.	Each	1		
10.2.3	Supply and install suitable brackets for storing the ladder, special tools and earthing apparatus, and also brackets on the wall immediately adjacent to the annex door for mounting of fire extinguishers.	sum	1		







11.1.4	Supply and install a 1.2m welded mesh fence gate complete.	Each	1	OF SOL	JTH AFRICA
12,0	EXCAVATION, BACKFILLING AND COMPACTION				
	See Specification CEE-0023				
	T				
12,1	Platform				
12.1.1	Excavate existing ground to prepare insitu layer and compact. Supply and compact final layer G5 material and backfill foundation trenches.	m³	60		
12,2	Cables and Earthing				
			I		
12.2.1	Excavations for trenches in soil, importation of soil as per specification to bed cables, backfilling of trenches, compacting with mechanical rammer.	m³	96		
	OUTDOOR EARTH MAT				
13,0	See specification CEE-0177, BBB3059, BBB5452, BBB2721				
13,1	Supply and install a complete earth mat in the substation yard and also adhering to drawing no. BBB3620.	sum	1		
				1	
13,2	Supply and install 95mm <sup>2</sup> PVC insulated stranded copper conductor to bond various equipment to the earth mat complete with copper tinned lugs. Copper conductor and lugs to be SANS approved.	m	150		
	lugs to be SANS approved.				

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13,3	Supply and install anticorrosive compound such as Noxide to all crimped connections and exothermic welds.	sum	1		
	T		1	1	
13,4	Allow a rate to braze or exothermic weld all the below ground connections.	sum	1		
	<u> </u>		1		
13,5	Supply and install Malthoid or any approved insulation material to insulate the main traction transformer from concrete plinth.	sum	1		
			1	1	
13,6	Supply and install copper earth rods of 1.5m in length, which are suitably threaded to each end complete with a coupling and two brass rod termination clamps. Earth rods to be installed as per drawing BBB 3620. Earth rods not to be less than 70mm² copper in accordance with SANS1063.	sum	1		
13,7	Supply and install braded copper bonds on all gates. Bonds shall be painted silver. Wire size bonds shall be the equivalent of 95mm² copper conductor.	sum	1		
	<u> </u>		1	<u> </u>	
13,8	Supply and install AC earth leakage current transformer	Each	2		
	T T		1	<u> </u>	
13,9	Supply and install a weatherproof stainless-steel enclosure in which to house the AC earth leakage current transformer complete with the mounting required.	Each	2		

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13,10	Supply and install environmentally approved weed killer and then a 100mm layer of crusher stone.	m²	1000		
				1	
14,0	ANODE WALL PLATE AND BUSHINGS				
14,1	Supply and install a hot dip galvanised Anode Wall Plate	set	1		
14,2	Supply and install suitably rated wall bushings	Each	6		
15,0	YARD LIGHTING				
15,1	Design, supply and install wall mounted 400 W outdoor industrial lights with associated components including clamps, cables, fittings, protective steel cage.	Each	8		
			I.	1	
15,2	Supply and install a solid-state type of light-sensitive control unit with an impact resistance translucent cover.	Each	1		
			I.	1	
15,3	Design, supply and install Emergency outdoor lights supplied by solar panels.	Each	4		
15,3	<b>3kV DC RECTIFIER</b> See specification BBB0496, BBB5452				
			T	T	T
15.3.1	Design, supply and install a 6MW AC to DC rectifier complete with control panel and instruments, a diode monitoring panel with displays, cooling fans, attenuation circuit and associated equipment. The rectifier shall be of the 12-pulse configuration type.	Each	1		

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15.3.2	Design, supply and install a rectifier bay screen manufactures from 25mm woven wire type expanded metal fixed to an angle iron frame supported by square pillars complete with a bay gate and fixing material per rectifier unit. The rate to include the painting of screen, gate and pillars.	Set	1		
16,0	REACTOR COIL				
	See specification BBB3890, BBB5452				
	DDD3 <del>1</del> 32				
16,1	Supply and install a 1.8mH, air core reactor, complete with insulators and mounting brackets.	Each	1		
17,0	See Specification BBB3139, BBB3162, and BBB 5452				
			1		
17,1	Supply and install wave filter 1.173mH inductor coils complete with associated components and BBB3483.	Each	1		
			1		
17,2	Supply and install wave filter 1.759mH inductor coils complete with associated components and BBB3483.	Each	1		
17,3	Supply and install dry type wave filter 10uf capacitors complete with associated components.	Each	2		
17,3	wave filter 10uf capacitors complete with associated	Each	2		







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17,5	Supply and install wave filter discharge 75kΩ, 150kW resistor on a suitable panel or bar complete with discharge and earthing mechanism.	Each	4			
	, , , , , , , , , , , , , , , , , , ,		1	1	<u> </u>	
17,6	Design, supply and install frames and support brackets for the mounting of the wave filter capacitors, inductors, resistors and associated equipment.	Each	1			
17,7	Supply and install a fuse holder mounted on insulators complete with a 100A HRC fuse to protect the wave filter equipment and isolating and earth switch.	Each	1			
18,0	3kV DC POSITIVE ISOLATOR AND UNDER VOLTAGE RELAY					
	See specification BBB4724, BBB3005					
18,1	Supply and install positive isolator and earthing switch complete with operating mechanism situated in a metal panel complete with metering and wiring.	Each	1			
					1	
18,2	Supply and install a 3kV DC under voltage relay as part of the low voltage control gear of the positive isolator, complete with 3kV DC voltage divider, optic fibre transmitter, optic fibre receiver and control circuitry.	Each	1			
	,		·		1	







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19,1	Supply and install a mechanical key exchange system to prevent on load operation.	set	1			
20,0	3kV DC MODULAR HIGH SPEED CIRCUIT BREAKER PANEL					
	See specification CEE-0099, CEE-0227, BBB5452					
			1	1	1	
20,1	3kV DC High Speed Circuit Breaker					
20.1.1	Supply and install 3kV DC, 4000A, HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear, and any other fittings or component required for the correct operation of the HSCB.	Each	4			
			l		l	
20,2	Electronic Control Relay					
-,			<u> </u>	1	<b> </b>	
20.2.2	Supply and install an Electronic Control Relay with a 2-year warranty as per the requirements stated in clause 9.3.11 of the Scope of Works.	Each	4			
20,3	3kV DC Universal Busbar Earth Switch					
20.3.1	Supply and install a separate 3kV DC positive bus bar earth switch completes with electrical interlocking, mechanism and indication lights to be connected.	Each	1			



				.41117	OF SOUTH AFRICA
21,0	PRIMARY CIRCUIT CONTROL PANEL AND AC/DC DISTRIBUTION PANEL				
	See specification BBB2721				
	·				
21,1	Primary Circuit Breaker Control Panel				
			T		
21.1.1	Design, supply and install an indoor floor standing primary circuit breaker control panel complete with flag annunciator unit, protection relays (IEDs), phase failure relays, instruments meters, control equipment, event and fault recorder, indicating lights, a panel light, emergency stop button, terminal strips, bus bars, protection test blocks, wiring labels etc.	sum	1		
				l .	
21,2	AC/DC Distribution Panel				
21.2.2	Design, supply and install an indoor floor standing AC/DC distribution panel complete with relays, instruments, meters, selector switches, AC and DC circuit breakers, isolators, earth switches, lightning arresters, a panel light, change over contactors, terminal strips, bus bars, labels, voltage comparators, phase failure and sequence detection relays, timers, wiring, mechanical key interlocking etc. The board shall make provision for 30% additional space for future requirements.	Sum	1		
21,3	Special Labels				
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			A11/2	PASSENGER RAIL AGENCY OF SOUTH AFRICA
21.3.1	Supply and install special labels in accordance with SANS 10142-1 and associated safety regulations to each section of the AC/DC distribution panel warning against various supplies entering the board, various voltages in the board and the automatic change over supply which must be isolated when work needs to do in the board or on any supply. All other control panel shall be clearly labelled as well. Labels must also be secured to the outside covers of plugs and light switches. All labels shall comply with the relevant specification.	Sum	1	
22,0	BATTERY CABINET, BATTERY CHARGER AND BATTERIES			
	See specification BBB2502, BBB 5452			
22,1	110V DC Battery Charger			
22.1.1	Supply and install a 230V AC to 110V DC, 30A battery charger.	Each	1	
22,2	110V DC Battery Bank			
22.2.1	Supply and install 110V DC, 200Ah, 53 maintenance-free gel batteries	Sum	1	

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1	1		ı	OF SOL	JTH AFRICA
22.3.1	Supply and install a rigid battery bank stand capable of supporting the entire battery bank and also allows for 360-degree access to the battery bank for ease of maintenance.	Each	1		
23,0	TELECONTROL OUTSTATION				
	See specification BBC0653				
23,1	Supply and install a cabinet SIS500 outstation to be floor mounted.	No	1		
			T	T	ı
23,2	Supply and install a communication panel to link the SIS500 outstation to optic fibre backbone for Telecontrol complete with a fibre optic modem multiplexer, patch panel and power supply. The cabinet to be mounted on top of the SIS500 outstation.	No	1		
23,3	Meanwell 110V – 24V DC – DC converter installed inside	Each	1		
23,4	Logic Rack with 1 X PSU card	Each	1		
23,5	Logic Rack with DO cards	Each	2		
23,6	Logic Rack with DI cards	Each	3		
23,7	Logic Rack with LMCU Digital card	Each	1		

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c Rack with Pulse Rail c Rack with Latch Rail c Rack with Digital input Cards c Rack with IO Cables n long c Rack with RS232 cable	Each Each Each	1 12 48 10		
c Rack with Digital input Cards c Rack with IO Cables n long	Each	10		
c Rack with IO Cables	Each	10		
n long				
Rack with RS232 cable	Each	3		
c Rack with Common tive return cable	Each	3		
uminaires Indoor ting				
oly and install 65W, 110V ED luminaire suspended elow roof ceiling.	Each	2		
t Switches				
		T	1	
oly and install surface nted single lever two-way switch complete with cover and cover plated.	Each	2		
		1		
	ly and install surface nted single lever two-way switch complete with cover and cover plated.	ly and install surface nted single lever two-way switch complete with cover and cover plated.  Each sly and install surface nted single lever one-way	and install surface switch complete with cover and cover plated.  Each  2  Lly and install surface stand single lever one-way	ly and install surface nted single lever two-way switch complete with cover and cover plated.  Each 2  ly and install surface

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ĺ		1	ı	0F S0I	UTH AFRICA
24.4.3	Supply and install a PVC weatherproof outdoor light switch for the toilet complete with cover box and cover plate.	Each	1		
			T	Γ	T
24.4.5	Supply and install surface mounted DC rated single lever one-way light switch complete with cover box and cover plated.	Each	1		
24,5	Wire Ways and Galvanised Steel Tubing				
24.5.1	Supply and install metal trunking complete with clip-in cover plates, splices, elbows, tees, end caps and other accessories.	Sum	1		
24.5.2	Supply and install 20mm galvanised steel tubing complete with fittings, couplings, inspection boxes, covers and sets as required.	Sum	1		
			l	l	
24.5.3	Supply and install standard adapters to support LED light fittings onto the trunking. Two per light fitting. Supply and install steel wire cable and suitable insulated brackets to suspend trunking from the substation roof. Brackets shall be insulated from earth potential.	Sum	1		
			I	<u>I</u>	1
24.5.4	Supply and install PVC insulated wire for lights and switched socket outlets circuits (red, white, blue, black and grey). Wire to be SANS approved.	Sum	1		
			1	1	ı
24,6	AC Distribution Box				

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				UF SU	UTH AFRICA
24.6.1	Supply and install surface mounted industrial type AC distribution board. The board to be powder coated Eau-de-nil.	Sum	1		
					•
24,7	DC Distribution Box				
	1		Γ	T	1
24.7.1	Supply and install surface mounted industrial type DC distribution board. The board to be powder coated Eau-de-nil.	Sum	1		
24,8	LV Cables				
			I	<u> </u>	1
24.8.1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	Sum	1		
	COOLING AND				
25,0	VENTILATION				
	1				
25,1	Substation Fresh Air Supply				
25.1.1	Supply and install a fresh air supply fan consisting of two fans with a combined rating of 2.7m <sup>3</sup> /s at 150Pa.	Each	1		
	2.711178 at 150Fa.				
25,2	Thermostat Control Switch				



-			-48/	ENGER RAIL AGENCY UTH AFRICA
25.2.1	Supply and install a thermostat control switch. The thermostat control switch shall operate the two fresh air supply fans through a contactor installed in an AC/DC distribution panel. The position of the thermostat shall be determined on site.	Each	1	
			•	1
25,3	Battery Room Extractor Fan			
25.3.1	Supply and install a battery room extractor fan with local isolator rated for 0.2m <sup>3</sup> /s at 25Pa. The fan shall be appropriate for the zone location.	Each	1	
	,			1
25,4	Toilet Extractor Fan			
25.4.1	Supply and install the toilet extractor fan rated from 0.035m³/s. The rate shall include a delay timer for the fan which will be connected to the toilet light circuit.	Each	1	
26,0	INDOOR EARTHING			
26,1	Supply and install indoor earthing according to drawing CEE-TBD-7.	sum	1	
			1	 T
26,2	DC Earth Leakage Relay			
26.2.1	Supply and install DC earth leakage relay. The rate shall include zoning for earth fault locations.	Each	1	
	,			
26,3	Cable Earth Fault Relay			
	,			1
26.3.1	Supply and install cable earth faulty indication relay.	Each	1	

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				Illian	OF SOUTH AFRICA	
27.0	NEGATIVE RETURN MONITORING SYSTEM					
27,0	See specifications BBC1843 and BBC1844					
			T	1		
27,1	Supply and install a negative return monitoring system complete.	Each	1			
28,0	FIRE FIGHTING					
20,0	TINETIGITING					
28,1	Fire Risk Assessment					
28.1.1	Conduct a fire risk assessment and provide a report with recommendations.	sum	1			
28,2	Fire Fighting Equipment					
28.2.1	Design, supply and install firefighting equipment as per the accepted recommendations of the fire risk assessment.	sum	1			
	,		<u> </u>		<b>,</b>	
29,0	SECURITY SYSTEM					
29,1	Design, supply and install the security system complete with access control, vehicle registration identification, perimeter intruder detection system, CCTV cameras (2x Type 1 and 8x Type 4), IP cameras and electric fence.	sum	1			
			ı	1		
29,2	Supply and install the complete support structure for the outdoor cameras	sum	1			
30,0	WARNING NOTICES AND SIGNS					



-				Miles	OF SOUTH AFRICA	
30,1	Supply and install a complete set of warning notices and signs as per the specifications.	sum	1			
	SUNDRIES					
31,0	Sundries to be determined by Contractor					
31,1	Supply and install sundries as determined	sum	1			
32,0	DECOMISSIONING AND DEMOLITION					
32,1	DECOMISSIONING					
			<u> </u>	1	<u> </u>	
32.1.1	Decommissioning of existing equipment. The rate to including transportation to a storage facility at Roodepoort Depot including non- ferrous metals (i.e., cable conductors, etc.)	sum	1			
					<u>.</u>	
32.1.2	Conduct an oil test for PCB on all the electrical equipment with oil insulation.	sum	1			
32.1.3	Handling and disposal of oil containing PCB.					
32.1.4	Dismantling and disposal of hazardous and non-re-usable material (i.e., asbestos) to an environmentally approved disposal site.	sum	1			
33,2	DEMOLITION					

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33.2.1	Demolish the existing building, transformer plinth and all damaged concrete platforms. The rate shall include removal and transportation of rubble to an environmentally approved dumping site.	sum	1	
34,0	TRAINING			
34,1	Provide training on all substation equipment installed. The rate shall include theoretical training in a classroom setting and practical training on site. Allow for at least 6 Technicians, 2 Supervisors and 1 Technical manager.	sum	1	
			•	
35,0	MANUALS AND DATA PACK			
35,1	Provide 3 sets of detailed operating and maintenance instructions of all equipment, switchgear relays, transformers and other electrical equipment. Hard copies and electronic format on CD/Memory Stick.	set of 3	1	
36,0	TEST AND COMMISSIONING			
36,1	Factory Acceptance Test			
,	,			Ī
36.1.1	Allow for factory functional tests to be conducted by the manufacturers of all the equipment at their premises.	sum	1	
26.2	Site Assentance Test			
36,2	Site Acceptance Test			



36.2.1	Allow for functional equipment testing on site.	sum	1	
36,3	Cold Commissioning			
36.3.1	Allow for functional testing on all equipment (primary and secondary plant) and circuitry to prove proper functioning and installation thereof.	sum	1	
			•	
36,4	Hot Commissioning			
· · · · · · · · · · · · · · · · · · ·				
36.4.1	Allow for functional testing to prove the satisfactory operation of all equipment under live conditions.	sum	1	
37,0	TEMPORARY WORKS			
37,1	Allow for any deemed temporary works.	sum	1	
20.0	004050			
38,0	SPARES			
	Supply a 3kV DC HSCB, complete with metal housing, rack-out truck, base rails, a track breaker, main and auxiliary contacts, flapper gear,	Each	1	
38,1	and any other fittings or component required for the correct operation of the HSCB. This shall include a fully fitted DC feeder protection relay.	Edul	'	
38,1	and any other fittings or component required for the correct operation of the HSCB. This shall include a fully fitted	Each	'	
38,1	and any other fittings or component required for the correct operation of the HSCB. This shall include a fully fitted	Each	8	







			411		SENGER RAIL AGENCY OUTH AFRICA
38,4	Supply rectifier attenuation circuit fuse.	Each	1		
38,5	Supply rectifier fan motor.	Each	1		
38,6	Supply fan control card circuit relays and timers.	Each	1		
38,7	Supply rectifier RC ("Snubber) Circuit.	Each	5		
38,8	Supply wave filter circuit fuse.	Each	1		
38,9	Supply 110VDC under voltage monitoring relays.	Each	2		
38,10	Supply 400V AC power protection relay.	Each	2		
38,11	Supply a 65W 230V AC indoor LED luminaire lamp.	Each	1		
38,12	Supply a 65W 110V DC indoor LED luminaire lamp.	Each	1		
TOTA	AL FOR BILL OF QUANTITIES CAR	RRIED TO T	HE SUMMAF	RY OF PRICES	
	ANGLERS	TRACTION	6.6kV AC H	-FRAME	
		BILL OF QL	IANTITIES		
			RICAL WOR		
I4a	A bidder shall refer to the Pro	ject specifi	cation for de	tailed informat	ion per item
Item	Description	Unit	Quantity	Rate	Amount
1,0	50kVA, 6.6kV/400V DISTRIBUTION TRANSFORMER				

Each

1

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1,1

Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution

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	1			1111	OF SOUTH AFRICA	
	Transformer complete for the outdoor yard.					
2.0	DROP OUT FUSES					
2,0	DROP OUT FUSES					
2,1	Design, supply and install a 6.6kV Drop-Out Fuses for outdoor H - frame complete.	Each	3			
2,2	Design, supply and install lightning protection system complete	Sum	1			
3,0	3 POLE CIRCUIT BREAKER 100AMP					
3,1	Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete	Each	1			
4,0	LOW AND MEDIUM VOLTAGE CABLES					
4,1	Supply and install low voltage cables PVC, SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	М	sum			
5,0	POLE-MOUNTED METAL ELECTRICAL BOX					
5,1	Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable	No	1			



#### **MIDANNADALE 6.6kV AC H-FRAME**

#### **BILL OF QUANTITIES**

	CIVIL	- / (17)	RICAL WORKS		
	A bidder shall refer to the Pr	oject specific	cation for detaile	ed information	per item
tem	Description	Unit	Quantity	Rate	Amount
	50kVA, 6.6kV/400V				
1,0	DISTRIBUTION TRANSFORMER				
	Supply and install a 50kVA,			<u> </u>	
1,1	6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution Transformer complete for the outdoor	Each	1		
	yard.				
2,0	DROP OUT FUSES				
_,,	D.KO. 661 16626				
2,1	Design, supply and install a 6.6kV Drop-Out Fuses for outdoor H - frame complete.	Each	3		
	Design completed install				
2,2	Design, supply and install lightning protection system complete	sum	1		
	A DOLE CIDCUIT				
3,0	3 POLE CIRCUIT BREAKER 100AMP				
3,1	Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete	Each	1		
4,0	LOW AND MEDIUM VOLTAGE CABLES				
	TOLINOL UNDELO				
4,1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and	m	sum		



5,0	POLE-MOUNTED METAL ELECTRICAL BOX			OF St	DUTH AFRICA					
			T							
5,1	Supply and install a Pole Mounted Box IP65 Rated	Each	1							
	Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.									
TOTAL	TOTAL FOR BILL OF QUANTITIES CARRIED TO THE SUMMARY OF PRICES									

GRASMERE 6.6kV AC H-FRAME								
		BILL OF	QUANTITIES					
	CI	VIL AND EL	ECTRICAL WOR	KS				
	A bidder shall refer to the	Project sp	ecification for de	tailed informatio	n per item			
Item	Description	Unit	Quantity	Rate	Amount			
1,0	100kVA, 6.6kV/400V DISTRIBUTION TRANSFORMER							
1,1	Supply and install a 100kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution Transformer complete for the outdoor yard.	Each	1					
2,0	50kVA, 6.6kV/400V DISTRIBUTION TRANSFORMER							
2,1	Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution Transformer complete for the outdoor yard.	Each	1					
3,0	DROP OUT FUSES							
•								
3,1	Design, supply and install a 6.6kV Drop-Out Fuses for outdoor H - frame complete.	Each	6					
	<u> </u>		Т	Ţ				
3,2	Design, supply and install lightning protection system complete	Sum	1					



4,0	3 POLE CIRCUIT BREAKER 100AMP						
		•					
4,1	Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete	Each	2				
5,0	LOW AND MEDIUM VOLTAGE CABLES						
			1	1			
5,1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	sum	1				
	POLE-MOUNTED METAL						
6,0	ELECTRICAL BOX						
			<del>,</del>	<del>-</del>			
6,1	Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Each	2				
TOT	AL FOR BILL OF QUANTITIES C	ARRIED TO	THE SUMMARY	OF PRICES			



#### STREDFORD STATION 6.6kV AC H-FRAME **BILL OF QUANTITIES CIVIL AND ELECTRICAL WORKS** A bidder shall refer to the Project specification for detailed information per item Description Unit Quantity Rate Amount 50kVA, 6.6kV/400V 1,0 **DISTRIBUTION TRANSFORMER** Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC,50Hz, stepdown 1,1 Distribution Transformer complete for the Each 1 outdoor yard. 50kVA, 6.6kV/400V 2,0 **DISTRIBUTION TRANSFORMER** Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC,50Hz, stepdown 2,1 Distribution Transformer complete for the Fach 1 outdoor yard. **DROP OUT FUSES** 3,0 Design, supply and install a 6.6kVDrop-3,1 Each Out Fuses for outdoor H - frame complete. Design, supply and install lightning 3,2 Sum 1 protection system complete 3 POLE CIRCUIT BREAKER 4,0 100AMP Design, supply and install a 400V, 4,1 Each 2 200Amp, 3 Pole Circuit Breaker with drawable complete LOW AND MEDIUM VOLTAGE 5,0 **CABLES** Supply and install low voltagecables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all 5,1 Sum 1 the cables onto equipment. Rate to include compression glands, and any other accessories.



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6,0	POLE-MOUNTED METAL ELECTRICAL BOX						
6,1	Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Each	2				
	·						
TOT	TOTAL FOR BILL OF QUANTITIES CARRIED TO THE SUMMARY OF PRICES						

#### STRETFOD SIGNAL SUPPLY 6.6kV AC H-FRAME **BILL OF QUANTITIES CIVIL AND ELECTRICAL WORKS** A bidder shall refer to the Project specification for detailed information per item Item Description Unit Quantity Rate **Amount** 50kVA, 6.6kV/400V DISTRIBUTION 1,0 **TRANSFORMER** Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown 1.1 Each 1 Distribution Transformer complete for the outdoor yard. **DROP OUT FUSES** 2,0 Design, supply and install a 6.6kV Drop-Out Fuses for outdoor H - frame 2,1 Each 3 complete. Design, supply and install lightning 2.2 sum 1 protection system complete **3 POLE CIRCUIT BREAKER 100AMP** 3,0 Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker 3,1 Each 1 withdrawable complete LOW AND MEDIUM VOLTAGE 4,0 CABLES

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4,1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	Sum	1	OF SOUTH AFR				
5,0	POLE-MOUNTED METAL ELECTRICAL BOX							
5,1	Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Sum	1					
Т	TOTAL FOR BILL OF QUANTITIES CARRIED TO THE SUMMARY OF PRICES							

#### STRETFOD TRACTION 6.6kV AC H-FRAME **BILL OF QUANTITIES CIVIL AND ELECTRICAL WORKS** A bidder shall refer to the Project specification for detailed information per item Item Unit Quantity Description Rate **Amount** 50kVA, 6.6kV/400V DISTRIBUTION 1,0 **TRANSFORMER** Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown 1,1 Each 1 Distribution Transformer complete for the outdoor yard. 2,0 **DROP OUT FUSES**



Design, supply and install a 6.6kV Drop- Out Fuses for outdoor H - frame complete.	Each	3		
Design, supply and install lightning protection system complete	sum	1		
3 POLE CIRCUIT BREAKER 100AMP				
Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete	Each	1		
LOW AND MEDIUM VOLTAGE CABLES				
Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	Sum	1		
POLE-MOUNTED METAL ELECTRICAL BOX				
Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Each	1		
TAL FOR BILL OF QUANTITIES CARRIED	TO THE SUM	MARY OF	PRICES	
	Design, supply and install lightning protection system complete  3 POLE CIRCUIT BREAKER 100AMP  Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete  LOW AND MEDIUM VOLTAGE CABLES  Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.  POLE-MOUNTED METAL ELECTRICAL BOX  Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Design, supply and install lightning protection system complete  3 POLE CIRCUIT BREAKER 100AMP  Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete  LOW AND MEDIUM VOLTAGE CABLES  Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.  POLE-MOUNTED METAL ELECTRICAL BOX  Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.  Each	Design, supply and install lightning protection system complete  3 POLE CIRCUIT BREAKER 100AMP  Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete  LOW AND MEDIUM VOLTAGE CABLES  Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.  POLE-MOUNTED METAL ELECTRICAL BOX  Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Design, supply and install lightning protection system complete  3 POLE CIRCUIT BREAKER 100AMP  Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete  LOW AND MEDIUM VOLTAGE CABLES  Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.  POLE-MOUNTED METAL ELECTRICAL BOX  Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable  Each 1

	RESIDENSIA RELAYROOM 6.6kV AC H-FRAME								
	BILL OF QUANTITIES								
	CIVIL AND ELECTRICAL WORKS								
	A bidder shall refer to the Proj	ect specificati	on for detailed	d information	n per item				
Item	Description	Unit	Quantity	Rate	Amount				
1,0	50kVA, 6.6kV/400V DISTRIBUTION TRANSFORMER								



1,1	Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution Transformer complete for the outdoor yard.	Each	1	
0.0	50kVA, 6.6kV/400V			
2,0	DISTRIBUTION TRANSFORMER			
2,1	Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution Transformer complete for the outdoor yard.	Each	1	
3,0	DROP OUT FUSES			
3,3	2	<u> </u>		
3,1	Design, supply and install a 6.6kV Drop-Out Fuses for outdoor H - frame complete.	Each	6	
3,2	Design, supply and install lightning protection system complete	sum	1	
4,0	3 POLE CIRCUIT BREAKER 100AMP			
4,1	Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete	Each	2	
5,0	LOW AND MEDIUM VOLTAGE CABLES			
5,1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	m	300	
5,2	Supply and install Aluminium Bundled Conductor LT 4 core cables and provide brackets and structures	m	300	
6,0	POLE-MOUNTED METAL ELECTRICAL BOX			



	Supply and install a Pole Mounted Box IP65 Rated Orange Metal to							
6,1	Be Supplied with Rail Mast Mounting and Be Lockable complete.	Each	2					
ТОТ	TOTAL FOR BILL OF QUANTITIES CARRIED TO THE SUMMARY OF PRICES							

	RESIDENSIA TIE 6.6kV AC H-FRAME								
	BILL	OF QUANT	ITIES						
	CIVIL AND								
-	A bidder shall refer to the Project s	specification	n for detaile	d information p	er item				
Item	Description	Unit	Quantity	Rate	Amount				
1,0	50kVA, 6.6kV/400V DISTRIBUTION TRANSFORMER								
1,1	Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution Transformer complete for the outdoor yard.	Each	1						
1,2	Supply and install 400V, ratio 1:1 isolation transformer for auxiliary power supply	Each	1						
2,0	DROP OUT FUSES								
		•							
2,1	Design, supply and install a 6.6kV Drop-Out Fuses for outdoor H - frame complete.	Each	3						
2,2	Design, supply and install lightning protection system complete	sum	1						
		T	•						
3,0	3 POLE CIRCUIT BREAKER 100AMP								

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3,1	Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker	Each	1	OF SOUTH AFRICA
3,1	withdrawable complete	Each	'	
4,0	LOW AND MEDIUM VOLTAGE CABLES			
4,1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	m	300	
	Supply and install Aluminium			
4,2	Bundled Conductor LT 4 core cables and provide brackets and structures	m	300	
5,0	POLE-MOUNTED METAL ELECTRICAL BOX			
			1	
5,1	Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Each	1	
TOTA	AL FOR BILL OF QUANTITIES CARRIE	D TO THE	SUMMARY O	F PRICES



#### **EATONSIDE H-FRAME 6.6kV AC H-FRAME BILL OF QUANTITIES CIVIL AND ELECTRICAL WORKS** A bidder shall refer to the Project specification for detailed information per item Item Description Unit Quantity Rate Amount 50kVA, 6.6kV/400V DISTRIBUTION 1,0 **TRANSFORMER** Supply and install a 50kVA, 6.6kV/4000V, 1,1 Dyn11, 3-phase AC, 50Hz, stepdown Each 1 Distribution Transformer complete for the outdoor yard. **DROP OUT FUSES** 2,0 Design, supply and install a 6.6kV Drop-2,1 Out Fuses for outdoor H - frame Each 3 complete. Design, supply and install lightning 2,2 Sum 3 protection system complete **3 POLE CIRCUIT BREAKER 100AMP** 3,0 Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker 3,1 Each 1 withdrawable complete LOW AND MEDIUM VOLTAGE 4.0 **CABLES** Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor 4,1 equipment. Allow to terminate all the 300 m cables onto equipment. Rate to include compression glands, and any other accessories. Supply and install Aluminium Bundled Conductor LT 4 core cables and provide 300 4,2 m brackets and structures POLE-MOUNTED METAL ELECTRICAL 5.0 BOX Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied 5,1 Each 1 with Rail Mast Mounting and Be Lockable complete.



## TOTAL FOR BILL OF QUANTITIES CARRIED TO THE SUMMARY OF PRICES

	KWAGGASTRO	OM STATION	6.6kV AC H-FF	RAME	
	BI	LL OF QUAN	TITIES		
			CAL WORKS		
Item	A bidder shall refer to the Proje	•		information p	er item
ILEIII	Description	Unit	Quantity	Rate	Amount
1,0	50kVA, 6.6kV/400V DISTRIBUTION TRANSFORMER				
1,1	Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution Transformer complete for the outdoor yard.	Each	1		
1,2	Supply and install 400V, ratio 1:1 isolation transformer for auxiliary power supply	Each	1		
2,0	DROP OUT FUSES				
2,1	Design, supply and install a 6.6kV Drop-Out Fuses for outdoor H - frame complete.	Each	3		
2,2	Design, supply and install lightning protection system complete	Sum	1		
3,0	3 POLE CIRCUIT BREAKER 100AMP				
3,1	Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete	Each	1		
4,0	LOW AND MEDIUM VOLTAGE CABLES				

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4,1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories	Sum	1			
4,2	Supply and install Aluminium Bundled Conductor LT 4 core cables and provide brackets and structures	m	300			
5,0	POLE-MOUNTED METAL ELECTRICAL BOX					
5,1	Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Each	1			
	•	•		<u>,                                      </u>		
TC	TOTAL FOR BILL OF QUANTITIES CARRIED TO THE SUMMARY OF PRICES					
- 10	THE TOR BILL OF QUARTITIES OF	INICED TO THE	L COMMANT O	1 111020		

	HOUTHEUWEL 6.6kV AC H-FRAME					
	BILL OI	F QUANTITIES	3			
	CIVIL AND EL	ECTRICAL W	ORKS			
	A bidder shall refer to the Project sp	ecification for	detailed info	ormation per i	tem	
Item	Description	Unit	Quantity	Rate	Amount	
1,0	50kVA, 6.6kV/400V DISTRIBUTION TRANSFORMER					
1,1	Supply and install a 50kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown Distribution Transformer complete for the outdoor yard.	Each	1			
1,2	Supply and install 400V, ratio 1:1 isolation transformer for auxiliary power supply	Each	1			



2,0	DROP OUT FUSES				
2,1	Design, supply and install a 6.6kV Drop-Out Fuses for outdoor H - frame complete.	Each	3		
2,2	Design, supply and install lightning protection system complete	Sum	1		
3,0	3 POLE CIRCUIT BREAKER 100AMP				
3,1	Design, supply and install a 400V, 200Amp, 3 Pole Circuit Breaker withdrawable complete	Each	1		
4,0	LOW AND MEDIUM VOLTAGE CABLES				
4,1	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cables onto equipment. Rate to include compression glands, and any other accessories.	m	300		
	•		•		•
4,2	Supply and install Aluminium  Bundled Conductor LT 4 core cables and provide brackets and structures	m	300		
5,0	POLE-MOUNTED METAL ELECTRICAL BOX				
5,1	Supply and install a Pole Mounted Box IP65 Rated Orange Metal to Be Supplied with Rail Mast Mounting and Be Lockable complete.	Each	1		
	•			•	
TOTAL FOR BILL OF QUANTITIES CARRIED TO THE SUMMARY OF PRICES					
					1



#### 88KV HOUTHEUWEL INTAKE AC DISTRIBUTION SUBSTATION **BILL OF QUANTITIES CIVIL AND ELECTRICAL WORKS** A bidder shall refer to the Project specification for detailed information per item Item Description Unit Quantity Rate **Amount** 1,0 88kV MV AC DISCONNECTOR Design, supply and construct support steel structure for 88kV AC Disconnector 1,2 set of 3 1 outdoor yard complete. Design, supply and install an 88kV AC MV Disconnect for outdoor equipment 1,3 set of 3 complete 1 88kV MV AC PRIMARY CIRCUIT 2,0 **BREAKER** Design, supply and construct a foundation for 88kV, MV AC Primary 2,1 Set 1 Circuit Breaker outdoor yard complete. Design, supply and construct a support steel structure for 88kV AC Primary 2.2 Set 1 Circuit Breaker outdoor yard complete. 10MVA, 88kV/6.6kV DISTRIBUTION 3,0 **TRANSFORMER** Design, supply and install/construct Auxiliary Transformer plinth and bund 3,2 Each 1 wall. 25kVA, 6.6kV/400V DISTRIBUTION 4.0 **TRANSFORMER** Supply and install a 25kVA, 6.6kV/400V, Dyn11, 3-phase AC, 50Hz, stepdown 4,1 ach 1 Distribution Transformer complete for indoors. Design, supply and install/construct Auxiliary Transformer plinth and bund 4,2 wall complete.



5,0	6.6kV, MV VACUUM CIRCUIT BREAKERS			
5,1	Design, supply and install a 6.6kV, MV Vacuum circuit breakers for indoor substation complete.	Each	2	
6,0	FUSE LINK PANEL			
6,1	Design, supply and install a 5A, 6.6kV AC, 3Phase fuse link for the protection of the Auxiliary Transformer complete with the support bracket, bolts, nuts, washers and a suitable link stick.	Each	1	
7,0	TELECONTROL OUTSTATION AND TELECOMMUNICATION			
7,1	Supply and install a cabinet SIS500 outstation to be floor mounted.	Each	1	
7,2	Supply and install a communication panel to link the SIS500 outstation to optic fibre backbone for Telecontrol complete with a fibre optic modem multiplexer, patch panel and power supply. The cabinet to be mounted on top of the SIS500 outstation.	Each	1	
7,3	110V – 24V DC – DC converter installed inside	Each	1	
7,4	Logic Rack with 1 X PSU card	Each	1	
7,5	Logic Rack with DO cards	Each	2	
7,6	Logic Rack with DI cards	Each	3	
7,7	Logic Rack with LMCU Digital card	Each	1	



	1				
7,8	Logic Rack with Pulse Rail Cards	Each	1		
7,9	Logic Rack with Latch Rail Cards	Each	12		
7.10	Logic Rack with Digital input Rail Cards	Each	48		
7.44	Lastic Book Wild Collins 40 cm last	E. J	40		
7.11	Logic Rack with IO Cables 40cm long	Each	10		
7.12	Logic Rack with RS232 cable	Each	3		
7.13	Logic Rack with Common negative	Each	3		
	return cable				
8,0	110V DC Battery Bank				
	0			T	ı
8.1	Supply and install 110V DC, 200Ah, 53 lead acid battery bank.	Each	1		
0.0	Dattama Otana I				
8.2	Battery Stand				
	Supply and install a rigid battery bank				
	stand capable of supporting the entire		_		
8.2.1	battery bank and also allows for 360- degree access to the battery bank for	Each	1		
	ease of maintenance.				
	LOW AND MEDIUM VOLTAGE			T	
9,0	CABLES				
	Supply and install low voltage cables PVC, PVC. SWA, PVC multicore cables				
	between all the indoor and outdoor				
9,1	equipment. Allow to terminate all the cables onto equipment. Rate to include	Sum	1		
	capies onto equipment. Rate to include compression glands, and any other accessories.				
<u> </u>				<u> </u>	<u> </u>

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10,0	METAL ELECTRICAL BOX				
10,1	Supply and install a IP65 Rated Orange Metal, 500x400x200 mm to be fitted with 3xDIN rail and connector blocks.	Each	1		
11,0	LOW VOLTAGE DISTRIBUTION BOARD				
11,1	Supply and install 400V, LV DB board, Metal 18 way MINI Rail surface mount complete	Each	1		
					1
12,0	EARTH				
12,1	Supply and install an earth matt and spikes in accordance with Engineering Instructions.	Sum	1		
13,0	SUBSTATION BUILDING				
13,1	<ol> <li>Refurbish substation building/s and associated structures with vandal-proof doors.</li> <li>Supply and deliver wooden house for Security guardroom as per section 4.1.5</li> </ol>	Sum	1		
			<u>.                                      </u>		•
14,2	Supply and install double 5ft Fluorescent fittings and tubes	Each	3		
14,2,1	Supply and install 400w 220v, LED Flood lights to be installed on the outside walls of the Sub	Each	3		
14,3	Trench 110 meters by 1.2 meters deep to bury cables underground in accordance to Engineering Instructions.	m	110		
14,4	Provision is to be made for 500mm deep cable trenches inside substation foundations.	Sum	1		
			•		
Т	OTAL FOR BILL OF QUANTITIES CARRIE	D TO THE	SUMMARY OF	PRICES	



#### HOUTHEUWEL CABIN SUB 6,6KV AC DISTRIBUION SUB **BILL OF QUANTITIES CIVIL AND ELECTRICAL WORKS** A bidder shall refer to the Project specification for detailed information per item Ite Description Unit Quantity Rate **Amount** m 300KVA 6,6KV/400V POWER 1,0 **TRANSFOMER** Each 1 Supply and install a 300kva,6,6kv/400v, Dyn11, 3 1,1 Each 1 phase AC,50Hz, stepdown power transformer completes for indoor 6,6KV MV VACUUM CIRCUIT 2,0 **BREAKER** Design, Supply and Install a 6,6kv, Vacuum Circuit Breaker complete 2,1 Each 4 for indoor substation 3,0 **FUSE LINKS PANEL** Design, supply and install a 5Amps,6,6kv Ac 3phase fuse link for the Protection of the Auxiliary 3,1 Each 1 Transformer complete with the support bracket, bolts, nuts, washers and a suitable link stick TELECONTROL OUTSTATION 4,0 AND TELECOMMUNICATION Supply and install a cabinet SIS500 4,1 Each 1 outstation to be floor mounted. Supply and install a communication panel to link the SIS500 outstation to optic fibre backbone for Telecontrol complete with a fibre 4,2 Each 1 optic modem multiplexer, patch panel and power supply. The cabinet to be mounted on top of the SIS500 outstation.

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PASSENGER RAIL AGENCY

			PA OF	SSENGER RAIL AGENCY SOUTH AFRICA
4,3	Meanwell 110V – 24V DC – DC converter installed inside	Each	1	
4,4	Logic Rack with 1 X PSU card	Each	1	
4,5	Logic Rack with DO cards	Each	2	
4,6	Logic Rack with DI cards	Each	3	
4,7	Logic Rack with LMCU Digital card	Each	1	
4,8	Logic Rack with Pulse Rail Cards	Each	1	
4,9	Logic Rack with Latch Rail Cards	Each	12	
4.1	Logic Rack with Digital input Rail Cards	Each	48	
4.1	Logic Rack with IO Cables 40cm long	Each	10	
4.1	Logic Rack with RS232 cable	Each	3	

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4.1 3	Logic Rack with Common negative return cable	Each	3		
5,0	BATTERY CABINET, BATTERY CHARGER AND BATTERIERS				
5,1	110V DC BATTERY CHARGER				
5,1, 1	Supply and install a 230V AC to 110V DC	Each			
5,2	110V DC Battery Charger				
5,2, 1	Supply and install 110V DC,100Ah,53 maintenance free batteries	Each		1	
5,3	Battery Stand				
5,3, 1	supply install a rigid battery stand capable of supporting the entire battery bank and also allows for 360-degree access to the battery bank for ease of maintenance	Each		1	
6,0	LOW AND MEDIUM				
-	VALTAGE CABLES				1
6,1	Supply and install low voltage cables SWA, PVC multicore cables between all the indoor and outdoor equipment. Allow to terminate all the cable onto equipment. Rate to include compression gland and any other accessories.	Sum		1	

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7,1	Supply and install a IP65 Rated Orange metal 500x400x200mm to be fitted with 3xDIN rail and connector blocks	Each	1		
8,0	LOW VOLTAGE DISTRIBUTION BOARD				
8,1	Supply and install 400V, LV DB board, Metal, 18-way mini-Rail surface mount	Each	1		
8,2	Design, Supply and install a 400V LT panel	Each	1		
9,0	EARTHING				
9,1	Supply in and install an earth matt and spike accordance with Engineering instructions	sum	1		
			T		
10, 0	SUBSTATION BUILDING				
10, 1	Design, supply and construct new brick building with cement roof to be erected to house substation measuring 6x4 meters	sum	1		
					<del>,</del>
	TOTAL FOR BILL OF QUANTITIES	CARRIED TO THE	SUMMARY OF PF	RICES	
	TOTAL FOR BILL OF QUANTITIES	CARRIED TO THE	SUMMARY OF PR	RICES	

### **SUMMARY OF PRICES**

Item	Description	Amount
1	Brought forward from – PRELIMINARY AND GENERAL	
2	Brought forward from – ANGLERS TRACTION SUBSTATION	
3	Brought forward from – STRETFORD TRACTION SUBSTATION	
4	Brought forward from – RESIDESIA TIE-STATION	
5	Brought forward from – HOUTHEUWEL TRACTION SUBSTATION	
6	Brought forward from – ANGLERS TRACTION 6.6kV AC H-FRAME	
7	Brought forward from – MIDANNADALE 6.6kV AC H-FRAME	
8	Brought forward from – GRASMERE 6.6kV AC H-FRAME	
9	Brought forward from – STREDFORD STATION 6.6kV AC H-FRAME	
10	Brought forward from – STRETFOD SIGNAL SUPPLY 6.6kV AC H-FRAME	
11	Brought forward from – STRETFOD TRACTION 6.6kV AC H-FRAME	
12	Brought forward from – RESIDENSIA RELAYROOM 6.6kV AC H-FRAME	
13	Brought forward from – RESIDENSIA TIE 6.6kV AC H-FRAME	
14	Brought forward from – EATONSIDE H-FRAME 6.6kV AC H-FRAME	
15	Brought forward from -KWAGGASTROOM STATION 6.6kV AC H-FRAME	
16	Brought forward from -HOUTHEUWEL 6.6kV AC H-FRAME	
17	Brought forward from -88KV HOUTHEUWEL INTAKE AC DISTRIBUTION SUBSTATION	
18	Brought forward from -88KV HOUTHEUWEL INTAKE AC DISTRIBUTION SUBSTATION	
19	Brought forward from -HOUTHEUWEL CABIN SUB 6,6KV AC DISTRIBUION SUB	
	Sub Total	
10	Plus 15% VAT	
11	Grand Total of Tender (Including VAT).	

