Title: **Umfolozi - Mbewu 765kV line: OPGW and Hardware Scope of Work**

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UMFOLOZI - MBEWU 765 KV LINE

OPGW and HARDWARE SCOPE OF WORK

Signatures of design team of Eskom Lines Engineering Services (LES)

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1. PROJECT DESCRIPTION

1.1 OVERVIEW

The Umfolozi - Mbewu 765kV line is a 98km line that is designed at 765kV but will be operated at 400kV. The first two towers at Umfolozi Substation will be a 400kV structure and there will be a 400kV section of line just outside Mbewu substation. The line will have a transposition tower however it will not be transposed at this stage.

A mainly hilly terrain is encountered throughout the line route with an altitude that varies from 420 to 970 m above sea level.

The project scope also involves the loop in of fibre to Duma substation.

It is recommended from the groundwire selection study that, a 12kA OPGW together with 19/2.7 ground wires be installed on the Umfolozi – Mbewu line.

At the Mbewu, Umfolozi and Duma ends of the OPGW cable, the necessary duct cable to the equipment rooms and patch panels will need to be installed as defined in the secondary plant document.

This document specifies the OPGW, Hardware and accessories for the installation as well as the Scope of work. The OPGW and hardware will be provided by the contractor who is allocated to the project, together with the Duct cable and Patch panel and accessories.

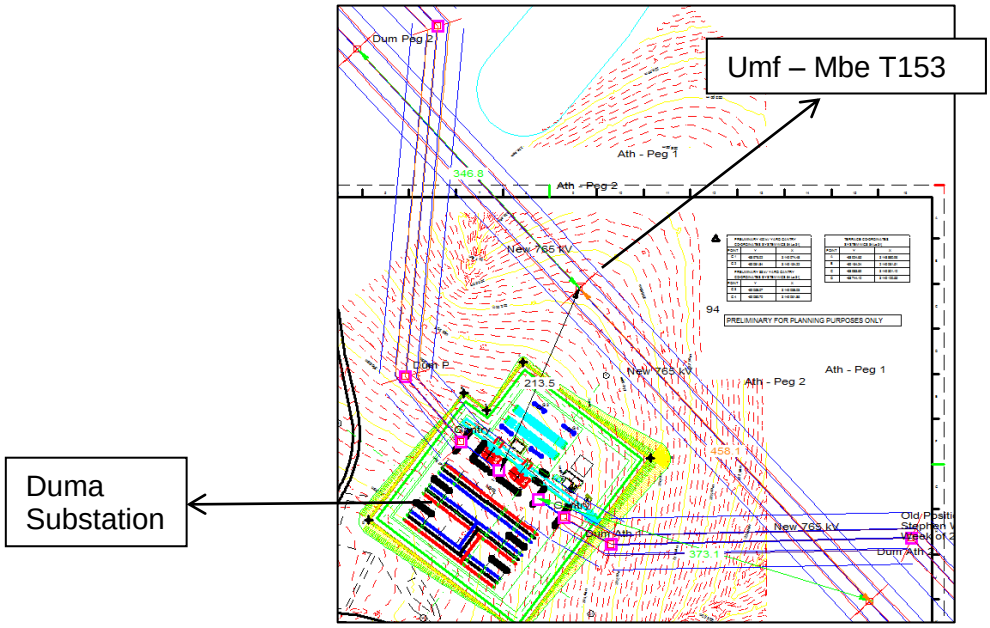
1.2 SCOPE OF WORK

1.2.1 The Scope of Work covers the installation of an OPGW cable system, including the installation of OPGW cable and matched hardware in accordance with this document.

1.2.2 Install a 12 kA, 48-core OPGW cable on the Umfolozi – Mbewu 765kV line. The OPGW is to be installed along the entire length of the line, from the gantry at Umfolozi to the gantry at Mbewu substation.

1.2.3 Along the length of the Umfolozi – Mbewu line the OPGW is required to be looped in and out of Duma substation.

1.2.4 For the loop in of the fibre to Duma substation consider the diagram below:



To achieve the successful loop in of the OPGW to Duma substation the following points are to be noted:

- Tower 153 (701C) will be used to loop the 48 core fibre in and out of Duma substation.
- 48 core duct cable will be used to bring the fibre into the substation as well as to bring it back out which requires a total trenching distance of approximately 450m.
- The incoming and outgoing duct cable will be connected to the same joint box on T153 of the Umfolozi – Mbewu line.

1.2.5 The total, approximate line length of the Umfolozi – Mbewu line is 99 Km (for the OPGW cable lengths required please refer to Section 6).

1.2.6 In all cases where duct cable is used, it is to be installed in HDPE piping. Point 1.2.4 above describes where duct cable is required as well as the approximate trenching distance required.

1.2.7 The underground duct fibre-optic cable is a completely non-metallic cable containing optical fibres and is enclosed in a Class 6 High-density Polyethylene (HDPE) protective tube. The cable is designed according to NRS 088-1 and installed according to NRS 088-2.

1.2.8 For splicing to the duct cable, the aerial fibre-optic cables shall be connected to the tower such that there is sufficient slack left to allow the splice enclosure/joint box to reach ground level. The splice enclosure shall be mounted as high on the tower as possible above the anti-climb device. The HDPE pipe shall be connected securely to the tower leg with a minimum of four stainless steel ‘band-it’ straps in-between.

1.2.9 At each of these towers that have a joint box connected to a duct cable, there should be a 1 m radius platform of concrete around the leg of the tower with the duct cable to prevent vegetation growth.

1.2.10 The towers with joints must have the cables fixed inside the towers. The manholes at each tower leg should have slack duct cable coiled without affecting the manufacturers bending radius.

1.3 GENERAL

1.3.1 The detailed project plan must be agreed between the Contractor and Project Manager prior to commencement of work. This will include amongst others, finalisation of attachment points, hardware fittings, substation entries, patch panels, cabinet locations etc. Where required type test reports must be submitted.

Note that a site visit with the Project Manager must be undertaken to finalise the exact details.

1.3.2 Contractors must note that all entry into substations and high-voltage yards must comply with the relevant regulations.

1.3.3 All lengths of both OPGW must be confirmed by the Contractor prior to commencement of work.

1.3.4 The drum size(s) and the locations of joints must be agreed between the Contractor and the Employer to optimise the installation.

1.3.5 All jointing must be performed by the Contractor.

1.3.6 The Contractor must ensure that the companion earthwire to the OPGW is continuous end-to-end (gantry-to-gantry), to ensure sharing of fault current.

1.3.7 All fibre cable off-cuts must be disposed of in accordance with TST32-245, Eskom's Waste Management Procedure.

1.3.8 Aircraft warning spheres will be free-issued by the Project Manager if required and must be installed either to replace existing spheres, or in new locations as instructed. Existing spheres may be re-used if required.

1.3.9 The contractor will install their own cables at the substation ends. However, should they opt to install their infrastructure at the same time as the substations are being equipped, fibre terminations amongst all parties will be co-ordinated by the Project Manager.

2. STANDARDS, SPECIFICATIONS AND DRAWINGS

2.1 STANDARDS

The standards within this section provide for the design and technical requirements for the line:

IEC 60120	Dimensions of ball and socket couplings of string insulator units.
IEC 60372	Locking devices for ball and socket couplings of string insulator units.
IEC 60383	Insulators for overhead lines with nominal voltage above 1000V.
IEC 60471	Dimensions of clevis and tongue couplings of string insulator units.
IEC 60815	Guide for the selection of insulators in polluted conditions
IEC 60826	Loading and strength of overhead transmission lines.
IEC 61089	Round wire concentric lay overhead electrical stranded conductors
IEC 61109	Composite insulators for AC overhead with nominal voltage greater than 1000V
IEC 61284	Overhead lines – Requirements and tests for fittings.
SANS 1556-1	ISO Metric screw threads part 1
SANS 1700	ISO Metric screw threads part 2
SANS 121	Hot-dip galvanized coatings on fabricated iron and steel articles specification.
SANS 935	Hot-dip zinc coatings on steel wire specification.
ISO 9001 ; 2000	Quality management systems – Requirements

2.2 SPECIFICATIONS

The line specification must take precedence if there is any conflict between it and the following specifications:

NRS 061-1:2002	Specification for Overhead Ground Wire with Optical Fibre – Part 1: Product Specification
NRS 061-2:2004	Specification for Overhead Ground Wire with Optical Fibre – Part 2: Installation Guidelines
NWS 1612 Rev 0	Specification for composite insulators.
SANS 10280	Code of practice for overhead power lines for conditions prevailing in South Africa.
240-70732888	Fibre Optic Cable System Acceptance Testing Procedure
32-245	Waste Management Procedure
TPC41-701	Approval and registration of drawings submitted by Contractors

NRS 088	Duct and Direct Buried underground Fibre Optic Cable
240-70733995	Optical Distribution Frames
TSP41-591	Transmission line towers and line construction.
240-60777474	Specification for suspension and strain assemblies and for hardware for transmission lines.
TSP41-692	Fibre Optic Joint Enclosures
TST41-168	Quality requirements for the procurement of assets, goods and services.
TST41-321	Earthing of Transmission Line Towers

2.3 DRAWINGS

LES–GEN–OPGW-1	OPGW insulated strain assembly for joint towers
LES-GEN-OPGW-2	OPGW insulated strain assembly
LES-GEN-OPGW-3	OPGW non-insulated strain assembly
LES-GEN-OPGW-4	OPGW non-insulated strain assembly for joint towers
LES-GEN-OPGW-5	OPGW non-insulated suspension assembly
LES-GEN-OPGW6	OPGW insulated suspension assembly
LES-GEN-OPGW7	Earth bonds
LES-GEN-OPGW8	Non-insulated down-lead clamps
LES-GEN-OPGW9	Insulated down-lead clamps
Gen-OPGW10	Junction box
Gen-OPGW11	Insulated Joint Tower Arrangements
Drawing 3	Joint Box arrangement on line Tower

- The drawings LES – GEN - OPGWx are for reference only and are simply indicative of the Employer's requirement.
- All OPGW hardware and Cable to be acquired from Eskom pre-approved suppliers. OPGW hardware is currently acquired from Preformed Line Products (PLP), while OPGW cable is sourced from Prysmium, ZTT, via Golden Dynasty and AFL.
- For further information on these suppliers, Eskom can make these details available.
- BEFORE ANY HARDWARE OR OPGW CABLE IS ACQUIRED, ESKOM NEEDS TO ACCEPT THE DRAWINGS FIRST. IF NEW OPGW CABLE IS BEING USED, COMPATIBILITY TESTS ARE REQUIRED TO CHECK THE STRAIN ASSEMBLY LOADING WITH THE NEW OPGW CABLE. ALSO, THE SUPPLIER OF THE OPGW CABLE MUST SUBMIT THE LATEST PLSCADD DATA TO ESKOM FOR CHECKING OF THE PROFILE.

3. SECTION A - OPGW

3.1 OPGW REQUIREMENTS

3.1.1 OVERVIEW

This section contains the optical, environmental, electrical and mechanical requirements for the OPGW cables. The OPGW cable is free-issue and will comply with all specifications in NRS 061-1, unless improved upon below. The OPGW must be tested before and after stringing according to the test specifications in NRS061-2.

Note that the Optical requirements of the OPGW and Duct cables are the same.

3.2 OPGW HARDWARE REQUIREMENTS

3.2.1 SPECIFICATIONS

All work must be carried out in accordance with the Standards, Specifications and Drawings listed in Section 2 and this document.

3.2.2 TECHNICAL DETAILS

The Contractor is encouraged to optimise (in terms of improved solutions and quantities) all insulation and hardware assemblies, but must nevertheless maintain overall connecting lengths of hardware assemblies, mechanical strengths, and electrical parameters.

The assemblies must be such that they can be coupled directly to the standard tower shackle provided with the tower.

Additional items may be required in the assemblies to suit the Contractor's designs. All conceptual drawings provided give critical dimensions only, and must not be considered as the final solution.

Test certificates for all vibration damping devices to be used must be submitted to the Employer by the Contractor before delivery commences, indicating the damper performance test(s) that have been conducted on the damping devices.

The strength requirement as indicated by the drawings refers to hardware material strength. In the case of suspension and earth wire strain assemblies, it does not refer to the slipping strength between the conductors and clamp for example.

With reference to specification NRS061-2, "Specification for Overhead Ground Wire with Optical Fibre – Part 2: Installation Guidelines", particular attention must be paid to the hardware arrangements at splicing towers. Furthermore, all the requirements in terms of grounding connectors, down-lead clamps, support insulators, earth tails with crimped on lugs, bending radius,

grounding cable connection to towers, cleaning of OPGW and towers, must be observed and adhered to.

3.2.2.1 Suspension Assembly for OPGW (See Drawings LES-GEN-OPGW-5 & LES-GEN-OPGW -6)

Conceptual assemblies are shown on the drawing for both standard and insulated OPGW suspension assemblies. When selecting hardware for OPGW great care must be taken not to apply excessive stresses on the conductor under any circumstances. Preference will be given to armour grip suspension clamps. The hardware strength requirements are indicated on the drawing.

3.2.2.2 Non-Insulated Strain Assembly for OPGW (See Drawing LES-GEN-OPGW-3)

Conceptual assemblies are shown on the drawing for standard OPGW strain assemblies. When selecting hardware for OPGW great care must be taken not to apply excessive stresses on the OPGW under any circumstances.

3.2.2.3 OPGW Non-Insulated Strain Assembly at Joint Tower (See Drawing LES-GEN-OPGW-4)

Continuous earth connection with adequate rating between the spans and to the tower steelwork must be established in accordance with Section 3.2.2.11. Non-insulated OPGW down-lead clamps must be used to support the OPGW to the splicing box. These down-lead clamps must be spaced no more than 2 metres apart and be installed at every tower member intersection and crossing with the OPGW conductor.

3.2.2.4 OPGW Insulated Strain Assembly (See Drawing LES-GEN-OPGW-2)

Continuous earth connection with adequate rating between the spans must be established in accordance with Section 3.2.2.11. Depending on the geometry of the tower, a support insulator might be required to prevent the ground cable from touching the tower structure under all environmental conditions.

3.2.2.5 OPGW Insulated Strain Assembly at Joint Tower (See Drawing LES-GEN-OPGW-1)

Continuous earth connection with adequate rating between the spans must be established in accordance with Section 3.2.2.11.

Depending on the geometry of the tower, a support insulator might be required to prevent the ground cable from touching the tower structure under all environmental conditions. Insulated OPGW down-lead clamps providing a minimum creepage distance of 50mm must be used to support the OPGW to the splicing box, including any slack loops. These down-lead clamps must be spaced no more than 2 metres apart and be installed at every tower member intersection and crossing with the OPGW conductor.

The splicing box must also be fitted with suitable stand-off insulators similar to those fitted to the down-lead clamps.

- OPGW cable lengths must be selected to avoid the necessity (as far as possible) of having any joints at a tower where the earth-wire/OPGW is required to be insulated from the tower steelwork.
- Where a joint at an “insulated earth-wire” tower is unavoidable, the installation must be carried out strictly as specified in the document NRS061-2, “Specification for Overhead Ground Wire with Optical Fibre – Part 2: Installation Guidelines”. A 50mm clearance to the tower steelwork must be observed for the cable, joint box and slack-loop by the application of approved insulation hardware, as prescribed above.
- The two sections of OPGW cable must be properly bonded so that fault current flow is unimpeded.
- Note on Drawing LES-GEN-OPGW-1 that a stand-off insulator must be mounted on the tower, and connected to the OPGW as shown in a similar manner to how the Shunt Cable is terminated. This is to support earthing of the OPGW by operating staff without causing damage to the OPGW. The stand-off insulator must be connected to the line side of the slack loop, but as close to the joint box as possible. This must be done per downlead.
- See also Drawing Gen-OPGW11 showing the safety earthing stand-off connections that are to be applied, and on the line side of the slack loop.

3.2.2.6 Typical Installation At Non-Insulated Splicing Tower

Detail arrangements depending on the type of tower must be supplied on how the splicing boxes must be installed above the anti-climbing devices. The minimum bending radius of 500mm, or as recommended by the cable manufacturer, must be adhered to at all times.

To allow sufficient slack for the joint to be brought to ground level for splicing, the OPGW downlead length at a joint tower must be equal to a minimum of the tower height plus 5m.

Should a duct cable be present at such a joint tower, then a minimum length of 10m should be allowed above the anti-climb guard.

For duct cables, a minimum slack loop of 5m must be allowed for.

All slack to be taken up in a proper manner.

Note that the tower clamps (down-lead & joint box) must be fitted with pinch bolts with "swivel seats" to avoid damaging the galvanising of the tower.

3.2.2.7 Substation Gantries

At the Mbewu, Umfolozi and Duma gantries, the OPGW cable must terminate on the substation gantries, not the terminal tower. Installation must be in general accordance with 3.2.2.6 above.

Note that the OPGW must be clamped on the outside of the gantry structure, and not threaded through the structure.

3.2.2.8 Earth-wire Insulators

These insulators must be applied to the installations depicted in drawings LES-GEN-OPGW-1, LES-GEN-OPGW-2, LES-GEN-OPGW-6 and FISTAJT.

3.2.2.9 Vibration Dampers For OPGW Conductor

The offer must include a schedule of required spacing for spans 200m to 1000m for the product offered.

The OPGW cable will typically be strung to the specified C-value, or to a value matching the sag of existing earth wires when applicable.

Where:

C = H/W

H = final horizontal tension (N)

W = vertical weight of conductor (N/m)

The requirements for damping aeolian vibration for the OPGW conductor strung at the specified C-value or any other C-value as agreed to with manufacturer, are that the maximum allowable stress in the OPGW outer layers must not exceed the safe bending limit set by the manufacturer. For the calculation of placement of Stockbridge type aeolian vibration dampers a wind speed of 7m/s perpendicular to the OPGW cable can be used. **Only multi-frequency type Stockbridge dampers must be used.**

Contractors must supply the results of a detailed vibration analysis on the positioning of Stockbridge-type dampers, based on the everyday tension provided and the characteristics of the cable offered, for the project manager's approval, prior to commencement of stringing.

3.2.2.10 Materials

OPGW:

The material and construction of the OPGW will be specified as per the offer.

FITTINGS

Tension & suspension assemblies and current transfer tab:

Only pre-formed type suspension and strain assemblies must be used. The choice of material for tension and suspension assemblies, as well as the earth bond mechanism, must be specified by the OPGW manufacturer to match the material of the OPGW and will take precedence over this specification. In order not to initiate galvanic type couplings using dissimilar materials and thereby enhancing corrosion of the materials, the following must be observed. If the OPGW outer layer is of steel, the fitting material will be of steel material. When the OPGW outer layer is of aluminium or aluminium clad steel material, the fitting material will be of either an aluminium alloy or aluminium clad steel material. In all cases the correct lay direction of the fittings in relation to the OPGW must be observed. Normally the lay direction of the fitting wire is opposite to the outer OPGW layer direction.

3.2.2.11 Grounding Cable or Earth Bonds (See Drawings)

- The OPGW must be correctly bonded to earth at the terminal station gantries and at all non-insulated earth-wire towers. Type Test Certificates for proposed earth bonds must be available on request.
- The type of material and size will be adequate to safely handle the required short circuit rating and requirements of the OPGW as specified. The choice of material must also consider compatibility with the OPGW and current transfer tab, not to initiate galvanic corrosion.
- All earth bonds must be of the flexible type and be corrosion resistant. Earth bonds must be of sufficient length to connect the OPGW to the tower steel work. To accommodate this, one end of the earth bond must be fitted with a crimped lug enabling connection to the tower steel work by means of an M16 bolt. Before connecting the crimped lug or fitting to the tower members, the tower steelwork shall be cleaned to remove paint or grease (or both) to ensure proper electrical connection. After connection the exposed area(s) shall be re-painted or cold galvanized to prevent corrosion of the tower steel members. The other end of the earth bond must be fitted with a suitable clamp arrangement for connection to the OPGW.
- The pre-formed type “pig tail” earth bond is not acceptable. However connection of the earth bond to the OPGW or OPGW armour rods by means of pre-formed helical attachment, a current transfer tab or a parallel groove type (PG clamp) connection, will be

acceptable on condition that results of electrical testing be submitted. The electrical testing must be performed not on the earth bond in isolation but on the complete connected assembly including the OPGW simulating a typical fault current in field conditions. The type of material and size must be adequate to safely handle the required short circuit rating requirements of the OPGW as specified. The choice of material must also consider compatibility with the OPGW not to initiate galvanic corrosion. When using parallel groove type clamps, the design must be such that no excessive stresses, that will affect the performance of the OPGW under any circumstances, will be induced.

- The companion earth-wire must be continuous from gantry to gantry. It may be necessary to install additional jumper straps on this earth-wire. The Contractor must allow for this eventuality, and perform the necessary work.

3.2.2.12 Tensile Type Test

A tensile type test must be performed on the OPGW, **together with the line hardware to be used on the actual system**, to prove that the combination will achieve a tensile performance of a minimum of 95% of the stated UTS of the OPGW cable. (Note: UTS= ultimate tensile strength). A type test report, witnessed by the Employer or its appointed representatives, must be submitted after tender award and prior to installation.

Note: the Contractor should ensure that when the relevant strain hardware and OPGW cable are tested and eventually installed, the relative movement between inner and outer layers (in the case of a multi-layer construction) should be the minimum possible. This may either be achieved by selecting the appropriate cable construction for the intended hardware to be used or selecting appropriate hardware for the suggested cable construction.

The OPGW cable plus hardware may be considered to be a system. The Contractor must therefore supply the hardware correctly matched to the OPGW cable to minimise installation and operational problems during the life of the cable, under all conditions.

3.2.2.13 Joint Boxes

All the joint boxes for the OPGW must be in accordance with TSP41-692.

Joint boxes must have 4 re-sealable ports, which remain sealed until required. The joint boxes must be capable of multiple re-entries without damaging the sealing mechanism.

Joint boxes must be accepted by the Employer.

All joint boxes must be mounted as high in the tower as practical, to avoid theft. It must be ensured that the mounting height of the joint box is such that the safe working clearance from any of the phase conductors to the joint box is not less than the distance as specified below:

- 400kV - 4.0 metre + 1 metre = 5.0 metre

4. SECTION B – CABLE SPECIFICATIONS

Three OPGW cable suppliers are currently on the Eskom OPGW national contract and each supplier provides cables with different parameters. The design leader should ensure that in instances where specific cable parameters are required from a design perspective, the project manager is made aware of these requirements so that the cable from the correct supplier is procured. The cable supplier should ensure that the cable can be strung up to a C-value of 2100m which ensures a similar sag profile to the parallel earthwire and therefore ensures adequate clearance to the phase conductors. For this particular application, a 12 kA OPGW cable is required as specified in Section 1.2.

5. SECTION C – TESTING

5.1 TESTING REQUIREMENTS

5.1.1 Joint Testing

All joints must be tested in accordance with the latest revision of Eskom Fibre Acceptance Test Procedure 240-70732888, Class B.

5.1.2 For requirement of the testing of secondary plant equipment please refer to the secondary plant document.

6. SECTION D – SUMMARY OF HARDWARE QUANTITIES & OPGW JOINT POSITIONS

6.1 UMFOLOZI - MBEWU 765 KV OPGW BOQ (INCLUDING DUMA LOOP-INS)

Table 6.1.1: Summary of Hardware Quantities

Item	Description	Unit	Quantity	Quantity With Spares	Comments
1	**OPGW cable (material only)**				
1.1	48 Core duct cable (For loop in to Duma at Tower 153)	m	450	475	2 x drums of 237m each
1.2	Supply of 48-core, 12kA OPGW cable	m	97917	107708	
2	**Aerial Hardware**				
2.1	Standard Strainer assemblies non insulated (FNISTA)	ea	94	98	

2.2	Standard Strainer assemblies complete for joint towers (FNISTA-JT)	ea	44	48	
2.3	Insulated Strainer assemblies complete for joint towers (FISTA-JT)	ea	10	12	
2.4	Insulated Strainer assemblies complete (FISTA)	ea	54	58	
2.5	Standard suspension assemblies (FNISUA)	ea	93	97	**To come with Tongue oval eyes**
2.6	Insulated suspension assemblies complete (FISUA)	ea	37	40	**To come with Tongue oval eyes**
2.7	Standard Crossrope assemblies (FNISUA)	ea	0	0	
2.8	Insulated Crossrope assemblies complete (FISPA)	ea	0	0	
2.9	Standard down lead clamps Non Insulated	ea	500	520	
2.10	Insulated down-lead clamps	ea	100	115	
2.11	Double Tab Earthbonds (XREB)	ea	93	97	**Supplier to confirm if one or two earthbonds are required.**
2.12	Current Transfer Saddles (CTS)	ea	97	100	**Supplier to confirm if one or two earthbonds are required.**
2.13	Current Transfer Saddles Double Shunt (CTS-DS)	ea	5	7	**Supplier to confirm if one or two earthbonds are required.**
2.14	Earthwire Insulators	ea	110	115	
2.15	Extension Links	ea	154	160	
2.16	Supply and install Vibration dampers (based on stockbridge dampers)	ea	992	1010	
2.17	Joint Boxes insulated	ea	5	6	
2.18	Joint Boxes Non insulated	ea	25	26	
2.19	Conversion of suspension tower to non-insulated joint position - supplied from PLP as a complete unit no need to order two (FNISTA-DST)	ea	3	4	**To be ordered with chainlinks**

Table 6.1.2: Summary of Drum Lengths and Joint Positions

Eskom drum lengths		
Structure numbers	Drum Lengths	With Spares
Gantry Umfolozi	0	0
2	360	395.4775
13	4229	4651.614
20	2576	2833.867
31	4453	4898.18
41	4595	5054.429
52	4161	4576.963
62	4346	4780.793
74	4492	4941.006
79	2384	2622.092
87	3240	3563.496
96	3676	4043.134
103a	2909	3200.182
112	3200	3520.106
123	4296	4726.087
132	4361	4796.802
141	4541	
146	2455	
153	2647	2911.949
163	4304	4733.993
173	4206	4626.934
180	3381	3719.097
190	4565	5021.221
196	2740	3013.951
206	4142	4556.377
211	2423	2665.556
219	3573	3930.363
226	3239	3563.425
231	1805	1985.849
Gantry Mbewu	618	679.3996
Total	97917	100012.3

7. SECTION F - RISKS

No	Risk identifed	Eskom mitigation proposal	Contractor proposal
1	Working on lines which are adjacent to other lines.	Contractor to follow Eskom safety practises stipulated in 240-47172520, Annex D and all other relevant Eskom safety practises.	
2	Line Crossings	A proper mitigation method must be provided by the contractor in terms of how they will mitigate against the earthwire falling during stringing, regulation and clamping in.	
3	Wildlife in the area	Contractor to monitor the wildlife in area, which could vandalise equipment and be a safety risk.	
4	A full schedule of sections to be done and must be highlighted to identify areas where equipment, start and end of each section will be done.	Contractor to provide a schedule based as to where they will start and end each section based on drum lengths. This will now determine how each tower will be stabilised during the pulling of this section.	

8. STATEMENT OF COMPLIANCE

The material and equipment supplied on this contract complies in all respects with the requirements of the specification.
For each paragraph mark Noted, Comply, Partially Comply, Don't Comply:

Paragraph	Noted, Comply, Partially Comply, Don't Comply	Paragraph	Noted, Comply, Partially Comply, Don't Comply
1.1		Section C	
1.2.1		5.1.1	
1.2.2		5.1.2	
1.2.3		6.1	
1.2.4		6.2	
1.2.5		6.3	
1.2.6		LES-GEN-OPGW-1	
1.2.7		LES-GEN-OPGW-2	
1.2.8		LES-GEN-OPGW-3	
1.2.9		LES-GEN-OPGW-4	
1.3.1		LES-GEN-OPGW-5	
1.3.2		LES-GEN-OPGW-6	
1.3.3		LES-GEN-OPGW-7	
1.3.4		LES-GEN-OPGW-8	
1.3.5		LES-GEN-OPGW-9	
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1.3.7		Gen-OPGW11	
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3.2.2			
3.2.2.1			
3.2.2.2			
3.2.2.3			
3.2.2.4			
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3.2.2.6			
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3.2.2.8			
3.2.2.9			
3.2.2.10			
3.2.2.11			
3.2.2.12			
3.2.2.13			
Section B			

9. LIST OF RETURNABLES

No.	Schedule	Returned?
1	Statement of Compliance or Non-Compliance	
2	Manufacturers' Brochures	
3	Letters of accreditation from the OPGW manufacturers	