

OHL ANNEX 5a GFI 69kV OHL

Schedule No. 1. Plant and Mandatory Spare Parts Supplied from Abroad	
2ST STAY ASSEMBLIES	
69KV2ST01 - Adjustable M24 Stay Assembly	Complete M24 adjustable stay rod assembly, complete with backing plate, base plate.
Refer to OHL ANNEX 4 (Stay assemblies)	
3SP STEEL POLES	
69KV3SPO2 to 69KV3SP05 - Galvanised Steel Poles	Supply and delivery to site of galvanised steel sectional monopoles as follows:
- Top, mid, and / or bottom sections connected by means of a telescopic slip joint. - The bottom section lengths of tripple pole sections, are to be determined prior to manufacture, in order to compensate for embedment on side-slope. - To be supplied complete with all necessary attachment brackets for line hardware attachments, stays, climbing cleats, lifting and assembly lugs. - To be fully hot dip galvanised.	
Refer to OHL ANNEX 1 (Structures)	
4BR BRACES	
69KV4BR01 - Brace tie strap for Type C tripple pole tower	Complete with all necessary attachment brackets for linking left, mid and right poles of together of tripple pole structures.
5LP LINE POST INSULATOR ASSEMBLIES	
69KV5LP01 - 115 to 138kV Braced LP	Braced Line Post Insulator assembly for use on Type A intermediate structures. Complete with gain base, armour grip suspension unit, all necessary line hardware, and vibration dampers suitable for applicable span lengths. Compatible with ACSR Guinea / AW conductor.
Refer OHL ANNEX 2 (Line Hardware)	
69KV5LP02 - 72kV Jumper Post insulator	Jumper Line Post Insulator assembly for use on Type B and C tension structures Complete with gain base, trunion clamp, all necessary line hardware. Suitable for ACSR Guinea / AW conductor.
Refer OHL ANNEX 2 (Line Hardware)	

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6TA STRAIN INSULATOR ASSEMBLIES	
69KV6TA01 - 72kV Twin Tens Ins assy (110kN x 2)	72kV Twin Tension Insulator assembly for Type C structures, complete with all necessary hardware, and vibration dampers, suitable for span lengths. Compatible with ACSR Guinea / AW conductor.
	Refer OHL ANNEX 2 (Line Hardware)
69KV6TA02 OPGW tension assy (100kN)	OPGW tension assembly for Type B & C structures, complete with all necessary hardware, and vibration dampers, suitable for span lengths. Compatible with AFL OPGW 48 Fiber AlumaCore AC-53/449.
	Refer OHL ANNEX 2 (Line Hardware)
69KV6TA03 Shield wire tension assy (100kN)	Shield wire tension assembly for Type B & C structures, complete with all necessary hardware, and vibration dampers, suitable for span lengths. Compatible with 7 x 3.35 Galvanised HSS steel Wire.
	Refer Refer OHL ANNEX 2 (Line Hardware)
69KV6TA04 72kV Tens Ins assy (110kN)	72kV Single Tension Insulator assembly for use on type B structures. Complete with all necessary hardware, and vibration dampers, suitable for applicable span lengths. Compatible with ACSR Guinea / AW conductor.
	Refer OHL ANNEX 2 (Line Hardware)
7SA OPGW SUSPENSION ASSEMBLIES	
69KV7SA02 OPGW non-ins susp AGS unit (100kN)	Non-insulated OPGW suspension AGS assembly, for use on Type A structures, complete with armour rods vibration dampers, suitable for span.
	Refer to OHL ANNEX 2 (Line Hardware)
8CL S/W CLAMP ASSEMBLIES	
69KV8CL02 Shield wire Clamp assembly	Shield wire clamp, for use on Type A structures, complete with armour rods and vibration dampers suitable for span lengths. Compatible with 7 x 3.35 Galvanised HSS steel Wire.
	Refer to OHL ANNEX 2 (Line Hardware)

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9CO CONDUCTOR, S/W, OPGW
69KV9CO01 Conductor (m) Guinea ACSR/aw (Aluminium clad steel) 69KV9CO02 OPGW (m) 10.5mm, 48 Fiber OPGW 69KV9CO03 Shield Wire (m) 7 x 3.35 Galvanised HSS steel Wire Refer to OHL ANNEX 3 (Conductors)
10E 69kV TOWER EARTHING
69KV10E01 6m counterpoise earth strap totether with earth spike The Counterpoise Earth Galvanised Flat steel strip shall be 6m x 50mm x 50mm x 5mm. The Connection to the Pole end shall be bolted to earth lug on the pole using M12 gavanised Botl,nut and washer. Optional addidinal Earth Connection Electrode End shall be installed, if 20 ohms is not achievable. The Connection Electrode End shall be Bolted connection to tinned 16mm copper earth spike using a paralel groove clamp. Refer to OHL ANNEX 3 (Conductors)
11SI SPARE PARTS
69KV11SI01 Set of aluminium emergency restoration structures One set of modular aluminium emergency restoration structures, complete with all nececcary erection tools and equipment. To include provision for four guyed structures, configurable as tension or intermediate structures. Refer to OHL ANNEX 10 (Emergency Restoration System)
69KV11SI02 Complete Type A 69kV suspension structure. Complete Type A 69kV suspension structure. Including stay rod assemblies, stay wire, and all necessary Line hardware assemblies, and all necessary tools and equipment required for emergency replacement. Refer to OHL ANNEX 1 (Structures)
69KV11SI03 Complete Type B 69kV tension structure. Complete Type B 69kV tension structure. Including stay rod assemblies, stay wire, and all necessary Line hardware assemblies, and all necessary tools and equipment required for emergency replacement. Refer to OHL ANNEX 1 (Structures)

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69KV11SI04 Complete Type C 69kV tension structure. Complete Type C 69kV tension structure. Including three poles, stay rod assemblies, stay wire, and all necessary line hardware assemblies, and all necessary tools and equipment required for emergency replacement. Refer to OHL ANNEX 1 (Structures)
12VD 69kV VIBRATION DAMPERS
69KV12VD01 Stockbridge vibration dampers for Phase conductor. Stockbridge vibration dampers for Phase conductor compatible with Guinea ACSR/aw (Aluminium clad steel). Refer to OHL ANNEX 2 (Line hardware)
69KV12VD02 Stockbridge vibration dampers for OPGW. Stockbridge vibration dampers for OPGW, compatible with 10.5mm, 48 Fiber OPGW. Refer to OHL ANNEX 2 (Line hardware)
69KV12VD03 Stockbridge vibration dampers for Shield Wire. Stockbridge vibration dampers for Shield Wire, compatible with 7 x 3.35 Galvanised HSS steel Wire. Refer to OHL ANNEX 2 (Line hardware)

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Schedule No. 3. Design Services

SCO301 LIDAR Survey

Provision of an arial Lidar topographic survey data for the length of the 69kV line.
Processed LIDAR data to be provided in PLS Cadd format, within 90 days of tender award.

The extents of the survey are a strip 300m wide.

The processed LIDAR data must include all above-ground obstacles including existing mv conductors, lv conductors, structures, towers, masts buildings, walls, cable ways, and vegetation all to be seperated into unique feature codes.

The processed LIDAR data must include all on-ground features including roads, edge of roads, rail, wetlands, water ways, agricultural land, plantations.

Over and above normal ground points, there shall be a seperate feature codes based on slope 20 deg, and 40 deg.

SCO302 Manual Survey

Provision of manual survey service for the duration of the project.

Identification of pipelines, communications ducts, manholes, and any other features which cannot be identified by Lidar.

Provision of cadastral data including road reserve boundaries.

Verification of suitability of structure and stay placement on site.

Pegging of structure pole positions and stays.

Verification of as built installation.

SCO303 Structure and Line Design

Provision of all Method 4 PLS Pole structure designs within 60 days of tender award.

Provision of all shop manufacture drawings within 90 days of tender award.

Provision of PLS Cadd line design within 90 days of tender award.

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SCO304 Testing Services

Testing Services - Provision testing services required for the line, including:

- **Site Testing**

- Geotechnical tests at each structure location.
- Earth resistance testing at each structure location.
- Stay pull testing at each stay locations (or as advised at the discretion of the engineer).
- Optical OTDR testing of OPGW, on delivery, and after installation.

- **Precommissioning Testing**

- **FAT:**

- Destructive testing of one Type A, B, and C structure (or as advised at the discretion of the engineer).
- Tensile testing of a conductor tension assembly together with Phase conductor, OPGW, and Shield wire.

- **Type tests**

- **Commissioning Tests**

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SCO305 Provision of Software

Provision PLS Cadd, for the duration of the project.

Provision of Caisson for the duration of the project.

Provision of PLS Pole for the duration of the project.

Provision of Global Mapper GIS Software for the duration of the project.

SCO306 Training

Provision of training for PLS Cadd, PLS Pole, GIS Ssset management.

Provision of on-site training with regard to structure erection methods and emergency structure restoration

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Schedule No. 4. Installation and Other Services	
1FO FOUNDATIONS	
69KV1FO01 to 69KV1FO04 - Foundations All civil and erection works for a foundation of one pole, as follows: - Setting out by RTK GPS, -Geotechnical test. -Nomination of soil type classification 1-5, signed off by a civil engineer -Selection of foundation type, based on selected soil nomination. - Excavation of foundation pit, - Installation of formwork, shoring, reinforcing and concrete works, - Planting of pole base section. - Application of required volume of stabilised 1:8 compacted backfill. -Installation of concrete pole cap. NOTE: A provisional geotechnical study can be provided to assist the Bidder in pricing. The final Geotech study will be carried out by the Contractor at each structure location. The Bidder shall provide a single foundation price irrespective of soil type nomination.	
2MO MOBILISATION	
69KV2MO01 Mobilisation of staff and equipment, for the duration of the 69kV OHL and the 33kV OHL Mobilisation of staff and equipment, for the duration of the 69kV OHL and the 33kV OHL. Provision of a Site camp with adequate office, housing, material storage, and workshop facilities, for the duration of the contract. Provision of all necessary services such as water electricity, refuse disposal, internet services, for the duration of the contract. Provision of security, as required for the duration of the contract.	
3AR ACCESS ROADS	
69KV3ER01 Access roads (Ea) Provision of all temporary access roads, as required, to safely transport plant, equipment and material to the structure work site.	
4BC BUSH CLEARING	
69KV4BC01 Bush clearing (Ea) Bush clearing for the length of the line 7m each side of the center line, in areas where trees could affect clearance. NOTE: No bush clearing is required where the conductors are higher than 50m above ground.	

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5ER ERECTION
69KV5ER01 Structure erection (ea) Erection of all structures, including installation of stays, and earthing for all structures, and any other structure related equipment.
6SG STRINGING
69KVSCO405 Stringing of Conductor (m) Stringing of Phase Conductor for line length (approximately 4.8km) - Tension stringing, sagging, regulating, and clamping in, of all phase conductors, including installation of all jumpers, sag adjusters, vibration dampers, warning devices, and any other conductor related equipment.
69KVSCO406 Stringing of OPGW (m) Stringing of OPGW for line length (approximately 4.8km) - The Contractor shall provide Tension stringing, sagging, regulating, and clamping, of OPGW. The Contractor shall provide the installation of all earthing down-leads, vibration dampers, warning devices, and any other OPGW related equipment. At the nearest structure to the midpoint of the line: The Contractor shall provide and install a slack spool bracket with integral dome splicing enclosure, onto the pole. The Contractor shall carry out OTDR Testing to prove the integrity of the OPGW on each side of the joint enclosure of the line. On completion of successful OTDR tests for both the OPGW sections, the Contractor shall splice (join) the OPGW inside the dome splicing enclosure. At the ends of the line: The Contractor shall install two slack spool bracket with integral dome splicing enclosure, onto the two end poles. These two slack spool brackets with integral dome splicing enclosure shall be provided. The Contractor shall terminate the OPGW into the dome splicing enclosure. The Contractor shall carry out OTDR Testing to prove the integrity of the OPGW between both ends of the line. On completion of successful OTDR tests for both the OPGW, as well as the connecting FO Cable, the Contractor shall splice the OPGW fibres to the FO Cable fibre. The Contractor shall electrically connect the OPGW metallic earth to the link box. Refer to OHL ANNEX 8 (SCHEMATIC OF CONNECTIONS)

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69KVSCO407 Stringing of Shield wire (m) Stringing of Shield wire for applicable span lengths - Tension stringing, sagging, regulating, and clamping in, of Shield Wire, including the installation of all earthing down-leads, vibration dampers, warning devices, and any other Shield Wire related equipment. The Contractor shall electrically connect the Shied Wire to the link box. Refer to OHL ANNEX 8 (SCHEMATIC OF CONNECTIONS)
7AWD AIRCRAFT WARNING DEVICES
69KV7AWD01 Aircraft Warning Devices (ea) Aircraft warning devices to be approved by aviation authority. Aircraft warning devices to be installed on shield wire (Compatible with 7 x 3.35 Galvanised HSS steel Wire), AND / OR OPGW (Compatible with 10.5mm, 48 Fiber OPGW).

OHL ANNEX 5b Trafalgar 33kV OHL

Schedule No. 1. Plant and Mandatory Spare Parts Supplied from Abroad	
2ST STAY ASSEMBLIES	
33KV2ST01 - Adjustable M24 Stay Assembly	Adjustable M24 Stay Assembly. Complete M24 adjustable stay rod assembly, complete with backing plate, base plate, including stay wire (1770MPa steel grade HSS stranded steel Steel Galv).
Refer to OHL ANNEX 4 (Stay assemblies)	
3SP STEEL POLES	
33KV3SPO5 - Galvanised Steel Poles	Galvanised Steel Poles - Supply and delivery to site of galvanised steel sectional monopoles as follows: - Top, mid, and / or bottom sections connected by means of a telescopic slip joint. - The bottom section lengths of tripple pole sections, are to be determined prior to manufacture, in order to compensate for embedment on side-slope. - To be supplied complete with all necessary attachment brackets for line hardware attachments, stays, climbing cleats, lifting and assembly lugs. - To be fully hot dip galvanised.
Refer to OHL ANNEX 1 (Structures)	
4BR BRACES	
33KV4BR01 - Brace tie strap for Type C tripple pole tower	Brace tie strap for Type C tripple pole tower. Complete with all necessary attachment brackets for linking left, mid and right poles of together of tripple pole structures.
5LP LINE POST INSULATOR ASSEMBLIES	
33KV5LP02 - 72kV Jumper Post insulator (22kN)	72kV Jumper Post insulator (operated at 33kV) - Jumper Line Post Insulator assembly for use on Type B and C tension structures. Complete with gain base, trunion clamp and all necessary line hardware. Compatible with ACSR Guinea / AW conductor.
Refer OHL ANNEX 2 (Line Hardware)	
6TA STRAIN INSULATOR ASSEMBLIES	
33KV6TA01 - 72kV Twin Tens Ins assy (110kN x 2)	72kV Twin Tens Ins assy, operating at 33kV - Twin Tension Insulator assembly for Type C structures. Complete with all necessary hardware, and vibration dampers, suitable for span lengths. Compatible with ACSR Guinea / AW conductor.
Refer OHL ANNEX 2 (Line Hardware)	
33KV6TA02 OPGW tension assy (100kN)	OPGW tension assembly for Type C 33kV structures. Complete with all necessary hardware, and vibration dampers, suitable for span lengths. Compatible with 10.5mm, 48 Fiber OPGW.
Refer OHL ANNEX 2 (Line Hardware)	

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33KV6TA03 Shield wire tension assy (100kN) Shield wire tension assembly for Type C 33kV structures. Complete with all necessary hardware, and vibration dampers, suitable for span lengths. Compatible with 7 x 3.35 Galvanised HSS steel Wire. Refer OHL ANNEX 2 (Line Hardware)
9CO CONDUCTOR, S/W, OPGW
33KV9CO01 Conductor (m) Guinea ACSR/aw (Aluminium clad steel) 33KV9CO02 OPGW (m) 10.5mm, 48 Fiber OPGW 33KV9CO03 Shield Wire (m) 7 x 3.35 Galvanised HSS steel Wire Refer to OHL ANNEX 3 (Conductors)
10E 33kV TOWER EARTHING
33KV10E01 6m counterpoise earth strap totether with earth spike The Counterpoise Earth Galvanised Flat steel strip shall be 6m x 50mm x 50mm x 5mm, and shall be installed at each steel pole. The Connection to the Pole end shall be bolted to earth lug on the pole using M12 gavanised Bolt, nut and washer. Optional addidinal Earth Connection Electrode End shall be installed, if 20 ohms is not achievable. The Connection Electrode End shall be a Bolted connection to tinned 16mm copper earth spike, using a paralel groove clamp. Refer to OHL ANNEX 3 (Conductors)
11SI SPARE PARTS
33KV3SP05 Complete Type C tripple pole tower (16m) Complete Type C 33kV tension structure. Including three poles, stay rod assemblies, stay wire, and all necessary line hardware assemblies, and all necessary tools and equipment required for emergency replacement. Refer to OHL ANNEX 1 (Structures)

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12VD VIBRATION DAMPERS
33KV12VD01 Stockbridge vibration dampers for Phase conductor. Stockbridge vibration dampers for Phase conductor compatible with Guinea ACSR/aw (Aluminium clad steel). Refer OHL ANNEX 2 (Line Hardware)
33KV12VD02 Stockbridge vibration dampers for OPGW. Stockbridge vibration dampers for OPGW, compatible with 10.5mm, 48 Fiber OPGW Refer OHL ANNEX 2 (Line Hardware)
33KV12VD03 Stockbridge vibration dampers for Shield Wire. Stockbridge vibration dampers for Shield Wire, compatible with 7 x 3.35 Galvanised HSS steel Wire Refer OHL ANNEX 2 (Line Hardware)

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Schedule No. 3. Design Services

SCO301 Route Survey

Provision of a manual or an arial Lidar topographic survey data for the length of the 33kV line. Processed LIDAR data to be provided in PLS Cadd format, within 90 days of tender award.

The extents of the survey are a strip 30m.

The survey data must include all above-ground obstacles including existing mv conductors, lv conductors, structures, towers, masts buildings, walls, cable ways, and vegetation all to be seperated into unique feature codes.

The survey data must include all on-ground features including roads, edge of roads, rail, wetlands, water ways, agricultural land, plantations.

Over and above normal ground points, there shall be a seperate feature codes based on slope 20deg, and 40 deg.

SCO302 Manual Survey

Manual Survey - Provision of manual survey service for the duration of the project.

Identification of pipelines, communications ducts, manholes, and any other features which cannot be identified by Lidar.

Provision of cadastral data including road reserve boundaries.

Verification of suitability of structure and stay placement on site.

Pegging of structure pole positions and stays.

Verification of as built installation.

SCO303 Structure and Line Design

Provision of all Method 4 PLS Pole structure designs within 60 days of tender award.

Provision of all shop manufacture drawings within 90 days of tender award.

Provision of PLS Cadd line design within 90 days of tender award.

SCO304 Testing Services

Testing Services - Provision testing services required for the line, including:

- Site Testin{

- Geotechnical tests at each structure location.

- Earth resistance testing at each structure location.

- Stay pull testing at each stay locations (or as advised at the disgression of the engineer).

- Optical OTDR testing of OPGW, on delivery, and after installation.

- Precommissioning Testin{

- FAT:

- Destructive testing of one Type A, B, and C structure (or as advised at the disgression of the engineer).

- Tensile testing of a conductor tension assembly together with Phase conductor, OPGW, and Shield wire.

- Type tests

- Commissioning Tests

OHL ANNEX 5b Trafalgar 33kV OHL

Schedule No. 4. Installation and Other Services

1FO FOUNDATIONS

33KV1FO04 - Foundations

All civil and erection works for a foundation of one pole, as follows:

- Setting out by RTK GPS,
- Geotechnical test.
- Nomination of soil type classification 1-5, signed off by a civil engineer
- Selection of foundation type, based on selected soil nomination.
- Excavation of foundation pit,
- Installation of formwork, shoring, reinforcing and concrete works,
- Planting of pole base section.
- Application of required volume of stabilised 1:8 compacted backfill.
- Installation of concrete pole cap.

NOTE: A provisional geotechnical study has been provided to assist the Bidder in pricing. The final Geotech study will be carried out by the Contractor at each structure location. The Bidder shall provide a single foundation price irrespective of soil type nomination.

3AR ACCESS ROADS

33KV3ER01 Access roads (Ea)

Provision of all temporary access roads, as required, to safely transport plant, equipment and material to the structure work site.

4BC BUSH CLEARING

33KV4BC01 Bush clearing (Ea)

Bush clearing for the length of the line 7m each side of the center line, in areas where trees could affect clearance.

NOTE: No bush clearing is required where the conductors are higher than 50m above ground

5ER ERECTION

33KV5ER01 Structure erection (ea)

Erection of all structures, including installation of stays, and earthing for all structures, and any other structure related equipment.

6SG STRINGING

33KVSCO405 Stringing of Conductor (m)

Stringing of Phase Conductor for line length (approximately 0.320km) - Tension stringing, sagging, regulating, and clamping in, of all phase conductors, including installation of all jumpers, sag adjusters, vibration dampers, warning devices, and any other conductor related equipment.

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33KVSCO406 Stringing of OPGW (m)

Stringing of OPGW for line length (approximately 0.320km) - The Contractor shall provide Tension stringing, sagging, regulating, and clamping, of OPGW.

The Contractor shall provide the installation of all earthing down-leads, vibration dampers, warning devices, and any other OPGW related equipment.

At the ends of the line:

The Contractor shall install two slack spool bracket with integral dome splicing enclosure, onto the two end poles.

These two slack spool brackets with integral dome splicing enclosure shall be provided by the UGC Contractor.

The Contractor shall terminate the OPGW into the dome splicing enclosure.

The Contractor shall carry out OTDR Testing to prove the integrity of the OPGW between both ends of the line.

On completion of successful OTDR tests for both the OPGW, as well as the connecting FO Cable, the Contractor shall splice the OPGW fibres to the FO Cable fibre.

The Contractor shall electrically connect the OPGW metallic earth to the link box.

Refer to OHL ANNEX 8 (SCHEMATIC OF CONNECTIONS)

33KVSCO407 Stringing of Shield wire (m)

Stringing of Shield wire for line length (approximately 0.320km) - Tension stringing, sagging, regulating, and clamping in, of Shield Wire, including the installation of all earthing down-leads, vibration dampers, warning devices, and any other Shield Wire related equipment. The Contractor shall electrically connect the Shield Wire to a link box.

Refer to OHL ANNEX 8 (SCHEMATIC OF CONNECTIONS)