Section 6: Employer's Requirements

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Specifications

This section describes the scope of works and technical requirements for the design, procurement, quality management, fabrication, supply and delivery of all material to the worksite, installation, testing and commissioning of the new OPGW.

In the event of conflict between the requirements stated in relevant documents, precedence for technical issues shall be given in the order below:

- This document, then
- Australian Standards, then
- International Standards, then
- Other documents at the discretion of SP.

1. BACKGROUND

The existing Lungga-Honiara 33kV line is made-up of Cherry ACSR/GZ phase conductor, 7/2.0 SC/GZ OHEW, ceramic/glass insulators, lattice steel towers, and a steel monopole.

The existing OHEW shall be replaced with continuous optical fibre ground wire (OPGW) to enable the line with communication capability and at the same time shield the phase conductor against direct lightning strokes.

The general arrangement and approximate spacing of the attachment points for the typical suspension and strain towers are shown in Figure 1.1. The vertical spacing between the OHEW and top phase conductor in lattice towers is generally about 3m. From this dimensions, the shielding angle at the suspension towers is about 31°. The strain steel monopole at T23 has its conductor attachments point in vertical configuration and the spacing between the OHEW and top phase conductor is 1.5m.

The existing arrangement of the earthpeak OHEW attachment points are shown in Figure 1.2. The existing OHEW will be retired and replaced with a suitable OPGW. The suspension earthpeak will need to be assessed and modified (refer to sample drawing SP-LH-AS-005 shts 1 to 3) to suit the arrangement of the proposed suspension OPGW assembly (see SP-LH-AS-003 sht 001)

Refer to list of drawings section for other available design drawings/schedules for Contractor's consideration.

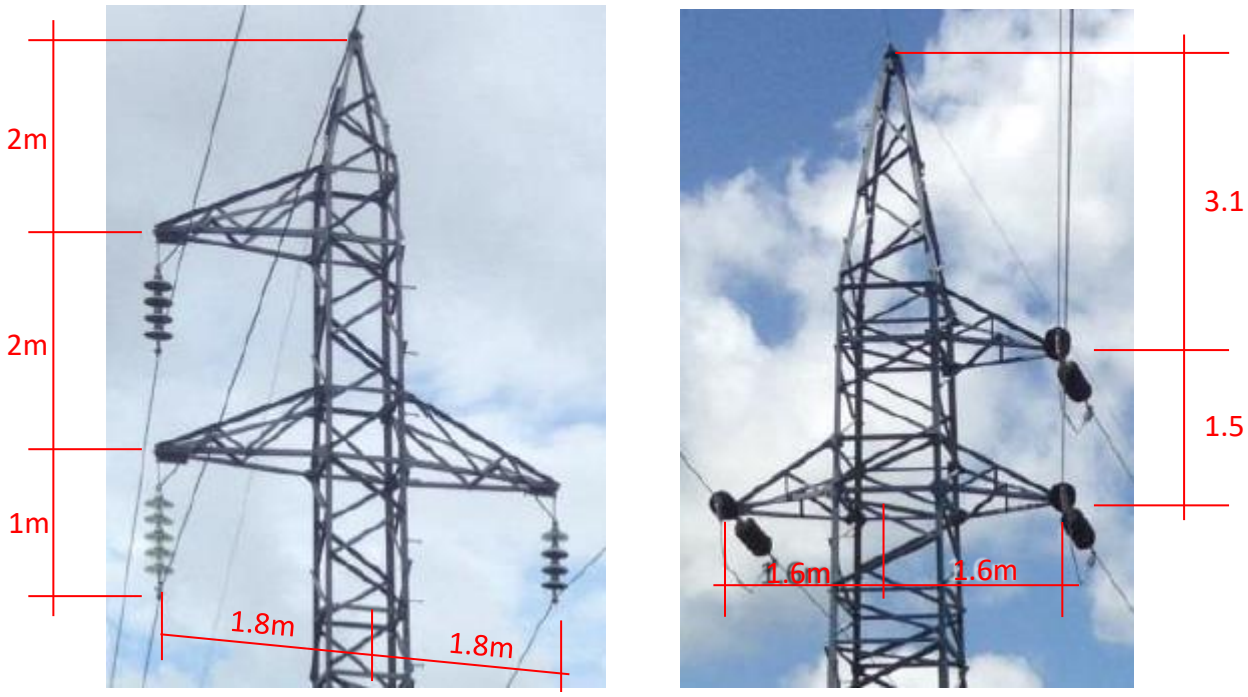

Figure 1.1: Typical tower arrangement (Left: Suspension, Right: Strain)

Figure 1.2: Existing OHEW assemblies – (Left: Suspension, Right: Strain)

2. BASIC REQUIREMENTS AND GUIDELINES

Basic requirements and guidelines for this Project are as follows:

1. All documents (e.g. designs, drawings, reports, schedules, etc) to be submitted by the Contractor shall be written in English language and prepared using the Systeme Internationale (SI or Standard International) system of units. They shall be easily readable, in good quality, and submitted to SP for review and approval before they are used for construction and / or fabrication.

2. All requirements in this Specification are to be considered as minimum requirements. The Contractor is to undertake its own design.

3. Unless specifically stated in this Specification, all drawings, reports, and other reference documents provided to the Contractor are "For Information" only. All associated risks involved with the use of any the information therein, either direct or derived, shall be borne by the Contractor.

4. As a minimum requirement, the Contractor shall submit the following documents as part of its bid submission:

    a. Program Schedule

    b. Curriculum vitae of Key Personnel

    c. Work method statement

    d. Design methodology

    e. Details of Project Quality Management System

    f. Details of Work Health and Safety System Proposal

    g. Outline Project Safety in Design Management Plan

    h. Schedule of equipment suppliers and manufacturing locations

    i. The Contractor's engineering design under this Project shall be in accordance with the requirements of this Specification and the equipment/materials supplied from approved suppliers. In case of conflict in the requirements, the Contractor shall bring this to the attention of SP and seek written confirmation of the requirements from SP. Under no circumstances is the Contractor to decide on his own what the applicable requirements are in case of such conflict. SP reserves the right to reject any or the complete part of the Work arising out of the Contractor's own decisions.

5. The construction works should ideally be during the dry season. Allowances in the schedule should be made to the accommodate review and approval period of the Contractor's submission.

6. The Contractor shall design, supply, install, test, and commission all materials required to complete the Works as a fully functional system whether described in detail or not in this Specification.

7. The Contractor shall repair any and all damage to existing installations incurred during the performance of the Works including, but not limited to, damage to existing transmission lines, underground services, roads, railways, drainage structures, fencing and gates.

8. The Contractor shall supply all the design and drawings in electronic form to SP upon completion of the Project. "As installed" documents must be supplied to SP no later than 15 days after the Commissioning of the OPGW.

9. The Contractor shall design, supply, install, test, and commission the Works required to replace the existing OHEW with a new OPGW. All Works shall be delivered using the best available engineering practice and procedures. The Contractor is responsible for the successful completion of the Project. The scope of work for this Project includes but is not limited to:

3. SCOPE OF WORK

The scope of work for this Project includes but is not limited to:

1. mobilisation to site;

2. route survey to confirm data shown in the tower schedule;

3. design, procure, supply, install, test and commission all individual components necessary to retire the existing OHEW and install the new OPGW, including but not limited to:

    a. OPGW including splice boxes and coiling frames;

    b. OPGW fitting assemblies and line hardware (e.g. dampers, joints, warning spheres, aerial warning lights, etc.);

    c. Suspension tower earthpeak;

4. dismantling and disposal of existing OHEW including all associated line hardware and fitting assemblies;

5. prototype assembly of the suspension tower earthpeak;

6. quality control of serial production at manufacturers shop facilities;

7. inspection prior to delivery to site;

8. packaging and organising safe transport and delivery to project site;

9. storage and handling of all required material for installation and construction at project site;

10. site establishment includes, but not be limited to, the following:

    a. installation and upkeep of site offices, first aid stations and crib rooms in location(s) determined by the Contractor to optimise the execution of the Works;

    b. responsibility for the supply of service facilities, secure storage, laydown and service areas that the Contractor deems necessary;

    c. provision of all temporary power required for the construction and commissioning of the Works and all associated facilities;

    d. provision of mobile telephones and/or satellite telephones, radios, computers and other equipment and communications cabling for voice and fax/data communications required by the Contractor;

    e. provision of desks and chairs for 2 SP personnel or nominated representatives;

    f. installation and maintenance of portable ablution facilities, compliant with all relevant Legislative Requirements, for use by Contractor's Personnel;

    g. construction and maintenance of any access roads required to complete the Works;

    h. development of traffic management plans to comply with the relevant road Authority's requirements and the Contractor's construction traffic for all aspects of the Works that must be subject to SP's review. The Contractor must take all necessary measures to ensure plant size is suitable to gain access to any restricted areas;

    i. provision of all temporary Works and barricading required to protect existing infrastructure from construction vehicle movements, including barriers, protective barricades, fences, windrows, bunds, diversions, signs, markers, warning lights, spotters and flag men, including maintenance of the foregoing. This must include the protection of edges of excavations and embankments along access and haul roads;

j. transportation to site of all items necessary to complete the Works including cranage to unload equipment and materials, safe storage in the nominated lay down areas, security and provision of all temporary timber packing, bearers and structures;

k. Reloading, transport and handling of equipment and materials from lay down areas to the point of use; and

l. removal of all temporary facilities following completion of the Works.

11. preparation and submission of the complete documentation of the work for SP review.

12. restore maintenance track(s) if damaged;

13. supply, install, and dismantle temporary scaffolds for road and rail crossing, as required;

14. produce all documentation including installation, operation and maintenance (IOM) manuals and Manufacturer Data Requirements (MDR) for SP records; and

15. site clean-up and demobilisation from site.

4. OPTICAL FIBRE GROUND WIRE (OPGW)

The design documentation provided with the tender document is based on the OPGW parameters shown below. The optical fibres (minimum of 24 cores) shall be appropriate for the communication system designed by SP. Under no circumstance, shall the OPGW is permitted the exceed the existing loads imposed on the structures by the existing OHEW. A Contractor nominated OPGW shall suit the requirements of this Project and shall be installed such that it maintains acceptable lightning performance as well as safe clearances to phase conductors.

Suitable coiling frame and joint boxes for the OPGW shall be provided by the Contractor. Joint boxes shall be sized to accommodate all splicing plus 10% spare splicing capacity and all required cables including a minimum of one additional cable entry. A 20m loop of OPGW shall be coiled on the coiling frame adjacent to the joint box at each joint. To assist maintenance and possible future branch-splicing, the joint boxes and attached fibres shall be readily removable to an environmentally controlled van at ground level. The joint boxes shall be suitable for mounting above the anti-climbing device without modification to the line structure. Details of Contractor's proposed arrangements shall be submitted to SP as part of the review process.

Parameter	Unit	7/2.0 SC/GZ OHEW	OPGW
Diameter, Dout	mm	6.0	7.6
Weight, w	N/m	1.697	1.608

Cross sectional Area, A	mm^2	21.99	29.00
Breaking Load, CBL	kN	26.00	26.00
Modulus of Elasticity, E	GPa	170	119
Coefficient of Linear Expansion, α	$x10^{-6}/°C$	11.5	15.2
Short time current capacity, I^2t	kA (2s)		5.5

5. SUSPENSION EARTHPEAK PROTOTYPE ASSEMBLY AND TRIAL FIT

The Contractor shall design, supply, assemble the prototype the suspension tower earthpeaks and trial fit it prior to mass fabrication. SP's review of drawings for prototype assembly of a earthpeaks shall not be taken as approval for subsequent production purposes. The fabrication details required under this Specification shall be checked for compliance in the assembled prototype earthpeak.

All fasteners (nuts, bolts, etc) shall be tightened "snug tight" as defined in AS 4100 to ensure that the various members are in close contact and all movements between adjacent members and/or fixings have been eliminated. Fasteners used in trial assembly shall not be re-used.

Within 10 business days prior to the intended inspection date, the Contractor shall notify SP of the availability of the prototype structures for inspection and trial fit.

SP may direct changes to the details so that the design conforms to the Works and such changes shall be incorporated into the constructed towers. Subsequent to SP's inspection and approval, no alteration to the existing towers shall be made without SP's written approval.

Drawings

Drawing Number	Drawing Title	Rev.
SP-LH-TS-001-001	Tower Schedule	0
SP-LH-LS-002 sht 001	Line Equipment Schedule	0
SP-LH-AS-003 sht 001	OPGW Suspension (to suit Ø7.6mm OPGW) Assembly	0
SP-LH-AS-004 sht 001	OPGW Strain (to suit Ø7.6mm OPGW) Assembly	0
SP-LH-AS-004 sht 002	OPGW Strain (to suit Ø7.6mm OPGW) Assembly-Insulated	0
SP-LH-AS-005 sht 001	Suspension OPGW Attachment Arrangement	0
SP-LH-AS-005 sht 002	Suspension OPGW Attachment Arrangement-Details	0
SP-LH-AS-005 sht 003	Suspension OPGW Attachment Arrangement-Details	0
SP-LH-SS-006 sht 001 to 023	Stringing Schedule-SFPOC24 OPGW	0

Program schedule

As part of the requirements for submitting a bid for this project, the Contractor shall assess, prepare, and submit a project schedule for review and consideration of SP.

Tender period	
Request for Tender	
Site visit	
Queries and Clarifications	
Bid submission	
Contract negotiations	
Contract award	
Start-up meeting	
Mobilisation	
Design Period	
Liaise with Suppliers	
Suspension earthpeak design, prototyping, and trial fit	
SP review and approvals	
Procurement	
OPGW	
OPGW fitting assemblies and apparatuses	
Suspension earthpeak mass fabrication	
Construction	
Retire existing OHEW	
Install suspension earthpeak on suspension towers	
String new OPGW	
Testing and commissioning	
Site clean-up	
Demobilisation	
Project completion	

Construction environmental social management plans/requirements

The Contractor shall ensure that all work is performed in accordance with the environmental regulation 2008 and laws of the Solomon Islands. The Contractor shall develop and submit a Construction Environment Social Management Plan (CESMP) to the Employer two weeks into the signing of contract who will then review the CESMP and issue approval. See annex for template of the CESMP.

The Contractor shall make it familiar with and reflect in the CESMP, the COVID-19, Health and Safety, Waste, Traffic, Emergency Response management measures and others as inidicated in the contract specifications. The CESMP shall provide quick and efficient response measures to likely environmental and social incidents on site.

The Contractor will recruite or appoint an Environment Safety Officer (ESO) as the Contractor's representative for environmental and social management. The representative shall have responsibility and authority over all matters concerning environmental and social aspect of the works on site.The Contractor shall ensure that any and all environmentally and socially sensitive incidents occurring on site shall be brought to the attention of the Employer. Relevant Environmental and Social management, systems, plans, notifications and consultations will need to be carried out prior to construction.

Construction methodology

The Contractor must not commence stringing the OPGW on any structure until SP has approved that the structure is complete in all respects. SP requires all OPGW activities to be carried out in an approved manner including the careful handling of OPGW before and during operations such as (but not limited to) the running out, tensioning, sagging, jointing, clamping of OPGW.

The Contractor shall consult with the OPGW manufacturer and follow its recommendations and requirements for proper inspection, handling, pre-installation testing, installation, and stringing, and testing of the OPGW.

It is the Contractor's responsibility to ensure that the work methods it employs do not infringe on the integrity of the transmission line supports, do not damage the OPGW in any way, are safe and are safe to all surrounding elements, personnel and the public.

As equipment weight and size very often interferes with both accurate stringing procedures and the physical size of pulling equipment can become prohibitive, the IEEE document generally recommends or requires a maximum strength factor of 50 per cent for the stringing equipment capacity. This is in order to limit the pulling equipment's size weight. The Contractor is hence required to understand or be familiar with the generated loads of proposed stringing operations.

Definitions and terminology with respect to stringing in this Specification shall be referenced as defined in the above IEEE document.

6. OPGW INSTALLATION

The following conditions must be applied when stringing OPGW:

- Square rigging must not be arranged at the tensioner end of the haul.
- The Contractor must consult with the manufacturer of tensioner machine to ensure that the proposed set up does not generate unnecessary or excessive torque and twist on the OPGW.
- The Contractor must consult with the manufacturer to determine if an anti-twist device (head board) is required.

- Anti-twist devices (head boards) that require grips to be installed between the device and the OPGW must not be used.

- The eye of any cable grip must be attached to a swivel shackle.

The Contractor shall provide constant surveillance of the connection point between the draw wire/rope and OPGW throughout the duration of the haul (use of a visual marker on the OPGW such as a plastic cable tie can assist with determining rotation).

7. STRINGING METHODOLOGY

At least 30 days prior to commencing stringing operations, the Contractor shall provide a work method statement for SP's approval with pertinent details as listed below but not limited to:

- The timeline for each pull section, sag and clamping of each line section, ensuring these are within the required SP time limitations.

- The methodology must ensure sufficient notice to stakeholders, including, if necessary any timing/deadline required by them. It should outline all arrangements made in this regard.

- A clear outline as to the methods and procedures that will be deployed in the stringing and final sagging of the OPGW (including creep methodology). These will include work instructions, procedures or method statements required for the specific transmission line to be strung.

- The proposed pulling tensions and methods for monitoring the applied loads.

- Show/compare that any applied loads will be within the allowable loads on the structures and the equipment.

- Equipment types (winches, brake, compressors and dies etc).

- The communication and control that will be deployed on any pull section, and any increases if necessary on particular sections. This must include names of key persons involved in the activity (eg: Stringing Supervisor, machines operators, safety observers, etc).

- Any pertinent aspect of a particular pull section, which is critical for the section or the Works contract, in particular if urban areas are involved.

- The precautions taken to ensure the safety of the operation – including induction control and temporary earthing plan.
- Quantities and allowance of spare/standby equipment.
- Indication of the procedures for all likely rework or temporary construction options that may arise.
- A drawing illustrating the site set up for the specific stringing run must be included with the methodology. As a minimum, the drawing must show the following:
    - All structures within the tension run/section including distances between structures;
    - selected locations for stringing equipment proposed;
    - the location of all OPGW joint box proposed;
    - differences in elevation and general topography of the section; and
    - all major crossings involved in each pull section.
- If required, the Contractor shall provide additional information, which might not have been covered in the submitted work method statement, in order to clearly understand the proposed technique.
- Sagging details, including creep and any off-set clipping information and results shall be submitted for approval to SP at least 14 days prior to the planned date of stringing any tension section. Such notice shall include any intended helicopter stringing operations.
- Prior to any helicopter stringing operations, the Contractor shall place a Public Notice (in the local newspaper) and contact all directly affected occupiers/landowners at least seven days before any such operation.
- In rural farming areas, the final implementation of any such helicopter stringing will be dependent on the Contractor obtaining the necessary permission from both the civil aviation as well as all affected stakeholders (with sensitive farm stock) within a one kilometre area of the effected stringing section.

8. CROSSINGS, NOTICES AND PERMITS

The Contractor shall make all arrangements and obtain any permits and approvals necessary from the service owner being crossed over. All material supply and construction costs associated with any such service crossing including the costs of any permit fees or fees charged for outages, services provided by the owners of such services, protection and the like associated with crossing of the service shall be borne by the Contractor.

In the case of power line crossings, the Contractor shall comply with the Electrical Safety Instructions issued by SP in all respects as well as with any other relevant Statutory requirements, standard and/or code as might apply.

Effective measures shall be taken (i.e. the use of substantial temporary conductor supports or hurdles) to prevent encroachment of statutory clearance or other clearance requirements of any issued permit, by the OPGW being strung to these services being crossed (power or communication lines, roads or railways).

On request, the Contractor shall provide SP with design information for any temporary structures, including the maximum allowable loads, the method of calculation, clearances, assumptions made and structural details. The method employed to minimise/contain risk in the event of a OPGW breaking at the puller and hitting the protected service shall be included in the work method statement.

9. HANDLING STRINGING EQUIPMENT

The OPGW shall be strung (or recovered) with tension methods, see IEEE 524 Section 4.2.

All handling/stringing equipment to be employed shall be as specified by the manufacturer. Unless SP approves otherwise, the tensioner bull wheel and the OPGW sheaves configuration and dimensions, and all other stringing equipment shall comply with the requirements of IEEE 524. The equipment shall be positioned as is recommended by the IEEE standard. The Contractor shall provide details/specifications of stringing equipment, if requested by SP. The basic equipment outline details shall be listed in the work method statement and any deviations from this IEEE standard shall be highlighted.

10. STRINGING

The Contractor shall consider minimising the risk of OPGW damage as well as maintaining the structure loadings to within allowable limits in selecting sites for pulling, tensioning, snub structures, and OPGW jointing.

The Contractor shall make all required temporary staying of both the structures as will be necessary. The OPGW may not be anchored to any portion of any tower, except on strain structures, and then only at points designed for such OPGW attachment. Temporary anchoring to structure footings and guy anchors will generally not be permitted.

Sufficient observers with communication radios or other means, whether for single or multiple drum pulls, shall be provided by the Contractor to ensure damage or over stressing of either the OPGW or the support structures does not occur. The Contractor shall maintain efficient continuous communication between all personnel involved in the pulling out or sagging operations.

The sheaves shall be hung at approximately the final elevation and position of the OPGW. For the security of both structure and OPGW, SP requires the sheaves to be hung off strops of lengths approximately that of the suspension assembly when the OPGW are strung through a strain or tension structure position.

In both the work method statement and on site, the Contractor shall ensure to the satisfaction of SP that scuffing or other damage to the OPGW will not occur in the OPGW installation process, and also following the implementation of any remedial action.

11. RUNNING OUT

The Contractor shall not commence stringing until SP has approved all of the supports and foundations in the relevant pull-section of the line and received and approved the Contractor's work method statement and stringing program.

The foregoing equipment section requirements as well as those in IEEE 524, shall be adhered to. The driving principal required is, that equipment and operation shall keep the OPGW clear of the ground and obstacles at all times, while stressing the OPGW as little as possible.

The maximum tension imposed on an OPGW during stringing operations (refer to OPGW manufacturer's guide) shall be just sufficient to clear obstacles on the ground. It may be necessary under certain circumstances to string the OPGW near sag tension to clear crossing structures such as poles of the highways, roads or distribution lines. Observers shall confirm the clearance is being achieved. However, where stringing tensions are greater than 10 per cent of the OPGW's UTS, consideration must be given to the degree of stressing of the OPGW based on the time involved. The stringing-planning shall also take into consideration, that over long pull-sections the tension close to the puller will be higher than at the tensioner-end. Another important consideration, with large elevation differences between supports in a tension section, considerable differences in the tension values can occur to the OPGW while it sits in sheaves.

In general, stringing tensions shall be approximately 50 per cent of the required 'ambient' sag tension. Unless a pre-tensioning procedure is being proposed, the Contractor shall not exceed the sag tension during the stringing operation, in both cases compliance with SP requires the puller and the tensioner to be equipped with approved tension indicating devices.

When OPGW are held under tension, additional safety clamps shall supplement auxiliary clamps prior to making the permanent attachments to the support attachment point. This is to be done by securing the OPGW to the strain earthpeak in the case of tension/strain make-offs. The earthing shall be outside of these safety clamp application points.

The Contractor is responsible for providing and maintaining earth-grounding precautions at all stringing locations, approved by SP.

The Contractor is warned of the danger of working on the line when any portion of the line under construction runs close to energised lines, this warning shall also be noted for during thunderstorms. If a thunderstorm is imminent, the Contractor shall remove its employees and/or sub-contractors from the line at no cost to SP except where covered under the Contract.

12. SAGGING PROCEDURES

The Contractor shall pull up the OPGW to the appropriate sag and tension determined from the approved stringing schedule. The Contractor shall submit the completed stringing schedule to SP for approval at least 14 days before sagging of any particular tension section. A complete set of the approved stringing schedule and criteria shall be available at all times on site.

The Contractor shall notify SP at least 24 hours prior to any planned sagging operations and unless otherwise approved no sagging shall be undertaken except in the presence of SP. The Contractor shall keep accurate installation records, which shall include all OPGW data like weather conditions, OPGW and ambient temperature at the time of sagging, final sag and/or tension, location of joints and dampers for submission to SP on completion of the stringing. These records shall also be submitted in electronic format. During the course of the fieldwork, the Contractor shall satisfy SP that the sags in the OPGW agree with the stringing schedules.

Sagging shall be conducted during daylight hours only under 'still air' conditions. The sagging work shall be suspended at any time, when in the opinion of SP or the Contractor that wind or other adverse weather conditions would prevent satisfactory sagging.

13. CONDUCTOR TEMPERATURE

Unless SP accepts an alternative suggested method, the temperature indicated on a thermometer, inserted in to a 2000 mm length OPGW (being sagged) from which a 150 mm core has been removed to accommodate the thermometer, shall determine the appropriate ambient temperature of the conductor. Any conductor creep correction shall be assessed from this ambient temperature. Such apparatus shall be freely suspended, free of structure shading, and where possible, shall be hung at the average elevation of the span or from the crossarm for at least two hours prior to taking the 'conductor' temperature reading.

Where, for whatever reason an intermediate snubbing position (and which will have been separately calculated) is created in a tension section, three adjacent suspension structure's assemblies (to the new sagging section) shall have the conductor moved into clamps (including whatever off-set may be required) prior to removing the temporary anchors and continuing the sagging of the new sag-section. These OPGW suspension assemblies shall remain in the plumb position once the new section is sagged and during plumb marking.

14. SAGGING OPGW PERIODS

When stringing OPGW the maximum period between running out and clamping-in shall not exceed 48 hours unless the OPGW is restrained from moving in the sheaves, which will require SP approval, or unless the Supplier indicates a different period.

15. SUSPENSION CLIPPING

Once a strain section's sagging is accepted, unless the sag section is over flat terrain, the conductor plumb point marking while in sheaves shall follow immediately thereafter. All offset adjustments of the conductors are undertaken from this plumb point when clamping-in takes place.

When transferring the conductors into the suspension units the Contractor shall employ a method approved by SP. The method shall avoid damage to the conductor being transferred.

Where conductors are supported in Armour Grip Suspension Units (AGSU) at suspension supports, due care should be taken to ensure that any new or existing fittings are designed and suitable for their intended use/purpose at the particular line position. Additionally, care should be taken to ensure the AGSU 'insert's joint' lies in approximately a horizontal plane.

OPGW clamps incorporating armour rods (e.g. AGSU) shall be employed/installed in strict accordance to the manufacturer's recommendations, which are to be supplied to SP. Unless otherwise specified the suspension clamp shall be within 50 mm of the rods centre point and the individual rod ends shall not exceed a variance of 12 mm between individual rods.

The OPGW clamping shall be carried out such that all OPGW suspension assemblies shall hang in a vertical plane at the sagging temperature. The cost of correcting conditions that fail to comply with this requirement shall be at the Contractor's expense including, if necessary, replacement material.

16. VIBRATION DAMPERS

Unless particular requirements exist, all spans shall have vibration dampers fitted, which shall be placed in accordance with the manufacturer's recommendation following offset clipping and clamping operations, once the OPGW is securely fastened in the clamp.

The number of dampers per span length shall be in accordance with manufacturer's recommendations, and spaced accordingly from the suspension clamp or mouth of the tension clamp. If the use of armour rods makes it impossible to meet these spacings, the first damper shall be positioned 25 mm from the end of the rods, thereafter spaced as specified normally from this first damper.

17. PACKAGING, HANDLING, AND TRANSPORT

The Contractor shall exercise appropriate care during storage, handling and transport of all components. The prime considerations at all times for these activities shall be safety and avoiding damage or stress to the components.

17.1 **PACKING**

All materials shall be carefully packed and secured for transport in such a manner that they are protected from all dust and climatic conditions during loading, transport, unloading and subsequent storage in the open. Materials shall be suitably packed and protected against vibration, movement and shock which may occur during loading and transport.

17.2 **HANDLING**

Methods of handling shall ensure that the component is not damaged or marked by lifting gear or by impact with the ground or other items. Components shall not be dragged, dropped, or unnecessarily rolled, but shall be lifted cleanly by a crane of suitable capacity operating with a spreader beam if necessary. Care shall be taken to ensure that the components are not unduly strained.

Heavy and bulky materials shall be provided with adequate lifting fixtures to facilitate ready handling during transit and on arrival at site.

17.3 **TRANSPORT**

The Contractor shall submit to SP its proposal for protection of equipment during transit. The responsibility for safe delivery remains with the Contractor.

All equipment supplied under this Contract shall be clearly identified on the outside of any case with the type and number of items contained therein and the gross weight. Large crates are to be marked on 3 sides, and smaller crates which can be easily manhandled are to be marked on two (2) sides at least.

A consolidated list of all consignments of components shall be maintained by the Contractor and shall be available for inspection by SP on request.

Risk management

Stakeholder consultation requirements

Owners engineers roles/scope

1. Respond to Request For Clarifications (RFC) from the bidders
2. Assist and advice during bid evaluation
3. Attend start-up meeting
4. Review Contractor's design and advice acceptability
5. Construction supervision
6. Witness testing and commissioning and final handover

Supplementary Information Regarding Works to Be Procured

Personnel Requirements

Using Form PER - 1 and PER - 2 in Section 4 (Bidding Forms), the Bidder must demonstrate that it has personnel who meet the following requirements:

No.	Position	Total Work Experience [years]	Experience In Similar Work [years]
1	Project Manager	5	3
2	Construction Manager	5	3
3	Site Engineer	5	3
4	Occupational Health & Safety	5	3
5	Line Mechanics	10	5

Equipment Requirements

Using Form EQU in Section 4 (Bidding Forms), the Bidder must demonstrate that it has the key equipment listed below:

No.	Equipment Type and Characteristics	Minimum Number Required
1		
2		
3		
4		
5		