

**Technical Specifications and Requirements of Emergency
Restoration System (ERS) for 400 kV Transmission Lines for
Parbati Koldam Transmission Company Limited**

SECTION-I

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1.0 General Information & Scope:

This specification covers the scope of work, technical description and requirements for design, manufacture, and supply of Emergency restoration systems for 400kV transmission lines.

1.1 The scope of work inter-alia includes design, manufacturing, testing and supply of complete set of Emergency Restoration System (ERS) up to designated stores.

1.2 Each set of ERS shall include the following:

- (i) modular ERS towers/structures, foundation/base plates, guys & guy hardware, anchor assemblies,
- (ii) composite insulators along with hardware fittings,
- (iii) tools and tackles and equipment's required for erection and stringing.
- (iv) computer software for analysing failure scenarios and identifying appropriate scheme of ERS deployment,
- (v) containers for ERS items (except mast structures).
- (vi) Other items as detailed in Section-2 of Technical specification and Bid proposal sheets.

Further, the scope of work shall also include training & demonstration as well as preparation and submission of comprehensive installation and maintenance manuals and guidelines for storage, transportation, erection, and stringing operation of ERS and associated equipment's.

1.3 The detailed BOQ for the above scope of work is indicated in the relevant schedule under this bidding documents.

2.0 Table of Compliance

Bidder shall use one copy of "Technical Specifications" (Section-I & Section-II) to indicate compliance status. Within the right-hand margin, Bidder shall indicate compliance status to each paragraph along with a cross-reference to its proposal and an index key for any explanation or comment.

In addition, The Bidder shall annotate the Table Of contents of the above stated volume to provide a high-level summary of compliance status, in both cases, the following symbols, and no others, shall be used:

C- Bid complies with all requirements in the adjacent paragraph

A- Bid is not compliant with the requirements in the adjacent paragraph, but a functional alternative is proposed.

X- Bid takes exception to the requirements of the adjacent paragraph and no functional alternative is proposed.

Only one symbol shall be assigned to a paragraph and shall indicate the worst-case level of compliance for that paragraph. The annotation may be handwritten.

Bidder shall underline, on the compliance copy, all requirements to which exceptions have been taken (X) or to which alternatives have been proposed (A).

Each alternative shall be clearly and explicitly described. Such descriptions shall use the same paragraph numbering as the bid document sections addressed by the alternatives. All alternative descriptions shall be in one contiguous section of the Bidder's proposal, preferably in the same volume, and titled "Alternatives". A separate section titled "Exceptions" should be provided containing any discussion or explanation Bidder chooses to provide concerning exceptions taken.

Alternatives, which do not substantially comply with the intent of the bid documents, will be considered exceptions.

The Purchaser will assess the merits of each alternative and exception and will be the sole judge as to their acceptance.

3.0 Weights and Measures

All weights and measures shall be in System International (S.I.) units. All fasteners shall be of Metric size only.

4.0 General Technical Conditions

4.1 The following provisions shall supplement all the detailed technical specifications and requirements brought out in the accompanying Technical Specifications. The Bidder's proposal shall be based on the use of equipment and materials complying fully with the requirements, specified herein.

4.2 Engineering Data

4.2.1 The Supplier shall furnish detailed engineering data of all the equipment's/tools offered by him. The review of these data by the Purchaser will cover only general conformance of the data to the Specifications and drawings. This review by the Purchaser may not indicate a thorough review of all dimensions, quantities and details of the equipment, materials, any devices or items indicated, or the accuracy of the information submitted. This review and/or approval by the Purchaser shall not be considered by the Supplier, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.

4.2.2 All engineering data submitted by the Supplier after final process including review and approval by the Purchaser shall form part of the Contract Document and the entire

works performed under these Specifications shall be performed in strict conformity, unless otherwise expressly requested by the Purchaser in writing.

4.3 Drawings

4.3.1 All drawings submitted by the Supplier including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, dimensions, material description, Bill of Materials, weight of each component, break-up for packing and shipment, fixing arrangement required, the dimensions required for installation and any other information specifically requested in the Specifications.

4.3.2 Each drawing submitted by the Supplier shall be clearly marked with the name of the Purchaser, the unit designation, the specification title, the specification number and the name of the Project. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be to the scale and in metric units.

4.3.3 The drawings submitted by the Supplier shall be reviewed by the Purchaser as far as practicable within four (4) weeks and shall be modified by the Supplier if any modifications and/or corrections are required by the Purchaser in compliance with the Specifications.

The Supplier shall incorporate such modifications and/or corrections and submit the final drawings for approval. Any delays arising out of failure by the Supplier to rectify the drawings in good time shall not alter the contract completion date.

4.3.4 The drawings submitted for approval to the Purchaser shall be in quadruplicate. One print of such drawings shall be returned to the Supplier by the Purchaser marked "approved/approved with corrections".

The Supplier shall thereupon furnish the Purchaser additional prints as stipulated in Section-II of Technical Specification along with one reproducible in original of the drawings after incorporating all corrections.

4.3.5 Further work by the Supplier shall be strictly in accordance with these drawings and no deviation shall be permitted without the written approval of the Purchaser, if so required.

4.3.6 All manufacturing and fabrication work in connection with the equipment/material prior to the approval of the drawings shall be at the Supplier's risk. The Supplier may make any changes in the design which are necessary to make the equipment/material conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Purchaser. Approval of Supplier's drawing or work by the Purchaser shall not relieve the Supplier of any of his responsibilities and liabilities under the Contract.

4.4 Manufacturing Schedule

The Supplier shall submit to the Purchaser his manufacturing, testing and delivery schedules of various items within thirty (30) days from the date of the Notification of

Award in accordance with the delivery requirements stipulated. Schedules shall also include the material and items purchased from outside Suppliers, if any.

4.5. Reference Standards

4.5.1 The codes and/or standards referred to in specifications shall govern, in all cases wherever such references are made. In case of a conflict between such codes and/or standards and the Specifications, latter shall govern; such codes and/or standards, referred to shall mean the latest revisions, amendments/changes adopted and published by the relevant agencies.

4.5.2 Other internationally acceptable standards which ensure equivalent or better performance than those specified shall also be accepted.

4.6 Design Improvements

4.6.1 The Purchaser or the Supplier may propose changes in the Specification of the equipment/material or quality thereof and if the parties agree upon any such changes, the Specification shall be modified accordingly.

4.6.2 If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the Supplier proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.

4.7 Quality Assurance

4.7.1 To ensure that the equipment and services under the scope of this Contract whether manufactured or performed within the Supplier's Works or at his Sub-Supplier's premises or at the Purchaser's site or at any other place of Work are in accordance with the specifications, the Supplier shall adopt suitable quality assurance programme to control such activities at all points necessary. Such programme shall be outlined by the Supplier and shall be finally accepted by the Purchaser after discussions before the award of Contract. A quality assurance programme of the Supplier shall generally cover but not limited to the following.

- (a) His organisation structure for the management and implementation of the proposed quality assurance program.
- (b) Documentation control system.
- (c) Qualification data for Bidder's key personnel.

- (d) The procedure for purchases of materials, parts/components and selection of sub-Supplier's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
- (e) System for shop manufacturing including process controls and fabrication and assembly controls.
- (f) Control of non-conforming items and system for corrective action.
- (g) Control of calibration and testing of measuring and testing equipment's.
- (h) Inspection and test procedure for manufacture.
- (i) System for indication and appraisal of inspection status.
- (j) System for quality audits.
- (k) System for authorising release of manufactured product to the Purchaser.
- (l) System for maintenance of records.
- (m) System for handling storage and delivery and
- (n) A quality plan detailing out the specific quality control procedure adopted for controlling the quality characteristics of the product.

The Quality Plan shall be mutually discussed and approved by the Purchaser after incorporating necessary corrections by the Supplier as may be required.

4.8 Quality Assurance Documents

- 4.8.1 The Supplier shall be required to submit all the Quality Assurance Documents as stipulated in the Quality Plan at the time of Purchaser's inspection of equipment/material.
- 4.8.2 The Purchaser or his duly authorised representatives reserves the right to carry out Quality Audit and Quality surveillance of the systems and procedures of the Supplier's/his vendor's Quality Management and Control Activities.

4.9 Purchaser's Supervision

- 4.9.1 To eliminate delays and avoid disputes and litigation it is agreed between the parties to the Contract that all matters and questions shall be resolved in accordance with the provisions of this document.
- 4.9.2 The manufacturing of the product shall be carried out in accordance with the Specification. The scope of the duties of the Purchaser, pursuant to the contract, will include but not be, limited to the following:

- (a) Interpretation of all the terms and conditions of these documents and specifications.
- (b) Review and interpretation of all the Supplier's drawings, engineering data etc.
- (c) Witness or authorise his representative to witness tests and at the manufacturer's works or at site, or at any place where work is performed under the Contract.
- (d) Inspect, accept or reject any equipment, material and work under the Contract in accordance with the Specifications.
- (e) Issue certificate of acceptance and/or progressive payment and final payment certificate.
- (f) Review and suggest modification and improvement in completion schedules from time to time; and
- (g) Supervise the quality assurance programme implementation at all stages of the Works.

4.10 Inspection, Testing & Inspection Certificate

4.10.1 The Purchaser, his duly authorised representative and/or outside inspection agency acting on behalf of the Purchaser shall have at all reasonable times access to the Supplier's premises or Works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture and if part of the Works is being manufactured or assembled at other premises or works, the Supplier shall obtain for the Purchaser and / or his duly authorised representative permission to inspect as if the equipment/materials were manufactured or assembled on the Supplier's own premises or works.

4.10.2 The Supplier shall give the Purchaser/Inspector written notice at (least 3 weeks in advance in case of domestic Supplies and at least 6 weeks in advance in case of foreign Supplies) of any material being ready for testing. Such tests shall be to the Supplier's account except for the expenses of the Inspector. The Purchaser/Inspector, unless witnessing of the tests is waived, will attend such tests within fifteen (15) days of the date of which the equipment is notified as being ready for test/inspection- or on a mutually agreed date, failing which the Supplier may proceed with the test which shall be deemed to have been made in the Inspector's presence and he shall forthwith forward to the Purchaser/Inspector duly certified copies of tests in triplicate.

4.10.3 The Purchaser / Inspector shall, within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Supplier, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Supplier shall give due consideration to

such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Purchaser/Inspector giving reasons therein, that no modifications are necessary to comply with the Contract.

4.10.4 When the factory tests have been completed at the Supplier's or Sub-Supplier's works, the Purchaser/Inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Purchaser/Inspector, the certificate shall be issued within fifteen (15) days of receipt of the Supplier's Test certificate by the Purchaser/Inspector. The completion of these tests or the issue of the certificate shall not bind the Purchaser to accept the equipment should it, on further tests after erection, be found not to comply with the Contract.

4.10.5 In all cases where the Contract provides for tests whether at the premises or works of the Supplier or of any Sub-Supplier, the Supplier except where otherwise specified shall provide free of charge such item as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Purchaser/Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Purchaser/Inspector or to his authorised representative to accomplish testing.

4.10.6 The inspection by Purchaser and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Supplier in respect of provision of the technical specification and agreed quality assurance programme forming a part of the Contract.

4.11 Design Co-ordination

The Supplier shall be responsible for the selection and design of appropriate equipment's/material to provide the best co-ordination performance of the entire system. The basic design requirements are detailed out in Technical Specifications. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance.

4.12. Design Co-ordination Meeting

The Supplier shall be called upon to attend design co- ordination meetings with the Purchaser, other Suppliers and the consultants of the Purchaser during the period of Contract. The Supplier shall attend such meetings at his own cost at New Delhi or at mutually agreed venue as and when required and fully cooperate with such persons and agencies involved during these discussions.

4.13 Packing

4.13.1 All the equipment's shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at

Purchaser's premises. The Supplier shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Packing should be such that long time storage at Purchaser's premises, if required, should not deteriorate the performance of any equipment/material supplied by the Supplier.

- 4.13.2 The Supplier shall include and provide for securely protecting and packing the equipment so as to avoid loss or damage during transport by air, sea, rail and road.
- 4.13.3 All packing shall allow for easy removal and checking at port/ Purchaser's premises. Wherever necessary, proper arrangement for attaching slings for lifting shall be provided. All packages shall be clearly marked for with signs showing 'up' and 'down' on the sides of boxes, and handling and unpacking instructions as considered necessary. Special precaution shall be taken to prevent rusting of steel and iron parts during transit by sea.
- 4.13.4 The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols, i.e. fragile, handle with care, use no hook etc wherever applicable.
- 4.13.5 Each package shall be legibly marked by the Supplier at his expenses showing the details such as description and quantity of contents, the name of the consignee and address, the gross and net weights of the package, the name of the Supplier etc.
- 4.13.6 To the maximum degree possible, the Supplier shall utilize the "metallic Containers" for shipping of equipment's/tools to India. The Supplier shall ensure that the equipment shall be properly packed, blocked, padded coated and protected in the "Containers" so as to ensure that such equipment is not damaged due to possible mishandling of "containers". The metallic containers shall be considered as the property of the Purchaser.
- 4.13.7 All shipments shall be shipped in units as large as practicable, but within the transportation limits. The equipment's may be nested in each other where desirable to reduce shipping volume provided such nesting shall not cause any damage to any such nested parts. Each piece of Works or equipment which is to be shipped as a separate piece or smaller parts packed within the same crate shall be legibly marked to show the unit of which it is a part and match marked to show its relative position in the unit, to facilitate handling/assembling at sites.

5.0 Technical Data Sheet

The Technical Data Sheet of the equipment/material shall be furnished by the Bidders in one original and four (4) copies along with their offer. The Bidder shall also furnish any other schedule information as in their opinion is needed to give full description and details to judge the item(s) offered by them.

6.0 Technical Information

The technical particulars of 400kV Double circuit A.C transmission lines under operation/ construction, for which ERS is to be designed are indicated below.

6.1 Electrical System Data

I	400kV A.C System	
(a)	Nominal voltage	400kV
(b)	Maximum system voltage	420kV
(c)	BIL (Impulse)	1550kV(Peak)
(d)	Power frequency withstand voltage (wet)	680kV(rms)
(e)	Switching surge withstand voltage (wet)	1050kV(Peak)
(f)	Minimum corona extinction voltage (Dry) at 0Hz under dry condition	Not less than 320kV r.m.s
(g)	Maximum Radio Interference at 1MHz and 305kV (dry condition)	1000 micro- volts

7.0 Service Conditions

7.1 Equipment/material to be supplied against this Specification shall be suitable for satisfactory continuous operation, storage & maintenance under tropical conditions as specified below:

1.	Maximum ambient temperature (deg Celsius)	50
2.	Minimum ambient temperature (deg Celsius)	-15
3.	Relative humidity (%)	70 to 100
4.	Maximum wind velocity (m/sec)	47 m/sec
5.	Maximum altitude above mean sea level (Meters)	2375 meters
6.	Isokeraunic level (days/year)	50
7.	Moderately hot and humid tropical, climate, conducive to rust and fungus growth.	

----- Technical Specification for ERS "Section-I" -----