

Technical Specifications and Requirements of Emergency Restoration System (ERS) for 400 kV Transmission Lines (Northern Region - Hilly terrain).

1. Introduction

Indigrid proposes to procure an Emergency Restoration System suitable for their 400kV Transmission Lines network spread across Northern Region of India.

The ERS shall be suitable for the following different types of lines:

- 400 kV Single Circuit Lines
- 400 kV Double Circuit Lines

Emergency Restoration System (ERS) shall consist of all necessary **Aluminium** restoration structures, anchors, hardware, insulators, construction tools, spare parts, computer software and training etc. essential for restoration of 400KV transmission lines.

2. Basic Design Criteria and Parameters

- Conductor (Option- I)- 2 x Moose / phase (400 kV)
- Conductor (Option- II)- 4 x Moose / phase (400 kV)
- Conductor (Option- III)- 3 x Snowbird / phase (400 kV)
- Conductor Tension- 22 % (at EDT after Creep)
- Earth Wire Tension- 17 % (at EDT after Creep)
- Maximum Span Length- 400 m (Ruling Span as per tower design)
- Wind Speed- 47 m/s (Wind Zone-4)
- Conductor Temperature- Hot 85⁰ C
- Maximum Ambient Temperature +50⁰ C
- Minimum Ambient Temperature -20⁰ C
- Maximum Relative Humidity- 100 % with continuous raining
- Overload Vertical and Horizontal Factor- 1.0
- Minimum Electrical clearance shall be maintained as per IS/IEC codes.
- Span reduction from standard span due to 15mm radial Ice condition on conductor to be worked out.

Loading Criteria adopted in Existing Transmission towers; (ERS towers shall be designed considering the loading parameters applied in Existing towers)

Conductor	400kV D/C	400kV S/C	400kV D/C
Name	ACSR Moose	ACSR Moose	ACSR Snowbird
Total Dia (mm)	31.77	31.77	30.57
Bundle	2/4	2/4	3
Bundle spacing (mm)	457	457	457
Weight (Kg/m)	2.004	2.004	1.657
UTS (Kg)	16438	16438	12050

Earth wire	400kV	400kV	400kV
Name	GSW (7/3.66)	GSW (7/3.66)	GSW (7/3.66)
Total Dia (cm)	1.098	1.098	1.098
Weight (Kg/m)	0.583	0.583	0.583
UTS (Kg)	6975	6975	6975
Design Parameters/Loads	400kV D/C	400kV S/C	400kV D/C
Wind Span (m)	400	400	400
Basic Wind load Parameters (IS-802)			
Wind Zone	4	4	4
Wind Speed (m/sec)	47	47	47
Wind Pressure (Kg/m ²)	73.1	73.1	73.1
Drag Co-efficient considered for conductor	1	1	1
Gust Response Factor considered for conductor	2.22	2.22	2.22
Drag Co-efficient considered for OPGW or EW	1.2	1.2	1.2
Gust Response Factor considered for OPGW or EW	2.29	2.29	2.29
Drag Co-efficient considered for Insulators	1.2	1.2	1.2
Gust Response Factor considered for Insulators	2.5	2.5	2.5
Minimum Creepage Distance in your Polymer/Porcelain Insulators (in mm)	13020	13020	13020

3. Requirement of ERS Structures

Table showing; Voltage Level of ERS Structures with Conductor Bundling.

Sl. No.	Existing Line Voltage & Conductor configuration	Restoration of Conductors Per Phase on ERS Line	Tower type	Angle Limitation	Span (m)	Wind speed (m/s)
1	400KV Quad/Twin Moose/Triple Snowbird	400KV Quad/Twin Moose/Triple Snowbird	C1A-Twin Suspension C1B-Quad Suspension	0° to 10° -Quad 0° to 20° - Twin	400	46
2	400KV Quad/Twin Moose/Triple Snowbird	400KV Quad/Twin Moose/Triple Snowbird	C2A-Twin Tension C2B-Quad Tension	0° to 60°	400	

As per the proposed requirements mentioned in Section 2 and 3, the Bidder shall workout for below ERS combination.

For Hilly Terrain: To restore 1 Circuit – Approx. 2km Line length

$C2 \times 16 = \text{Total } 16 \text{ ERS}$

OR

For Normal Terrain: To restore 1 Circuit – Approx. 2km Line length

$10 \times C1 + 6 \times C2 = \text{Total } 16 \text{ ERS}$

BOM Must include:

Tension Fitting's For 16 ERS – Quad Moose, Twin moose & Triple Snowbird.

Suspension Fitting's for 10 ERS - Quad Moose, Twin moose & Triple Snowbird.

4. Experience and Credentials

Bidder shall submit a complete list of previous ERS supply. But it is mandatory to submit documentary evidence / performance letters / certificates for the supply of **three** 765 kV and 400 kV ERS to reputed customers during last five years.

5. Standards and Testing

Bidder should submit the Test Reports for all major ERS Components and accessories according to the requirements and description specified in IEEE 1070-2006 (Guide for the Design and Testing of Transmission Modular Restoration Structure Components). During a course of procurement process, if it is desired by us to perform this test on any ERS Structure (only as per the design submitted along with a proposal) will be selected and no alternation in the design or number of guy wires etc. will be allowed in any circumstances.

6. Manufacturing

ERS Structures and its components shall be manufactured under ISO 9001-2008 certification and a copy in the name of the Manufacturer must be provided with a bid. MQP and QAP for the manufacturing of ERS Structures and its components shall be submitted subsequently. All other outsourced Components, Tools and Equipment shall be procured only from the ISO certified manufacturers.

7. Warranty of ERS Structures and After Sale Service

Warranty for ERS Structures and all the associated Components, Accessories and Equipment shall be provided for minimum 24 months from the date of operational acceptance/reconciliation of ERS. In case of any difficulty while understanding, planning and execution of ERS; a qualified person of the Manufacturer/ Supplier shall be approachable / available for urgent clarifications or online support for the minimum period of 5 years. This is a very important from the point of view safe, optimum and effective planning of ERS under emergency conditions. **“Undertaking”** shall be submitted accordingly along with a bid. Further, a detail for “After Sales Support Network” if available in India shall be submitted along with the offer.

8. Drawings (Configuration Summary) & BOM for ERS Structures

ERS Structure Drawings along with respective Configuration Summary and Parameters for different ERS as mentioned in Section- 3 and Basic Design Criteria and Parameters in Section- 2 must be submitted along with the bid.

Vendor shall also submit BOM with item-wise description, quantity, item No., Vendor (if applicable in case of insulators) etc. for the combinations specified in section-3. Two separate BOM'S shall be submitted for 16 ERS scheme as per combination mentioned in Section-3.

9. Guaranteed Technical Particulars (GTP)

Duly filled "Guaranteed Technical Parameters" (GTP) shall be submitted by a bidder for following group of items and requirements for ERS Structures.

- A. ERS Structure and Insulator Components.
- B. Insulator & Hardware Assembly.
- C. Guy Wire and its Components.
- D. Conductor and Guying Hardware.
- E. ERS Assembly and Erection Tools.
- F. Anchor Assembly and Installation Tools.
- G. Storage System.
- H. ERS Design back up files (PLS).
- I. Software & Training
- J. Field training on ERS Erection and stringing.