ANNEXURE-TQR

TECHNICAL PRE- QUALIFICATION REQUIREMENT

Name of customer: M/s TANGEDCO

Name of Project: 400KV GIS SWITCHYARD FOR 2 X660MW ENNORE STPP

Name of Item: **SHIELD WIRE**

PI No: 42I2200118

Date: 08.10.2021

SR. NO	TQR DESCRIPTION	SUPPORTING DOCUMENT TO BE ATTACHED
1.	The Bidder should have supplied GI Shield wire of minimum 7/9 SWG size during the last 7 (Seven) years as on the date of technical bid opening of this tender.	a) Copy of Purchase Orders / LR / MDCC / Dispatch instructions.

08/10/21

Prepared by

8-10-21

Checked by

08/10/21.

Approved by

8/10/21

(AGM & Head, TBEM)

BHARAT HEAVY ELECTRICALS LIMITED
TRANSMISSION BUSINESS GROUP
ENGINEERING MANAGEMENT, NEW DELHI

BHEL Document No.	Rev		Prepared by	Checked by	Approved by
TB-xxx-316-021	00	Name	PR	MK	RS
Type of Document Design Document		Sign			
Title Shield Wire		Date	07.03.14	07.03.14	07.03.14
		Group	TBEM		

Project: BHEL Rate Contract.

CONTENTS

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS

Distribution	To		O/C	TBMM	
	Copies		1	4	

SECTION – I

SCOPE, SPECIFIC TECHNICAL REQUIREMENT AND QUANTITIES

1.0 SCOPE

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of GI SHIELD WIRE.

The equipment is required for the following project.

Name of the customer : Rate contract for various customers

Name of the Project : Rate contract for various projects

1.1 SPECIFIC TECHNICAL REQUIREMENT

Refer Section II.

1.2 BILL OF QUANTITY

Sl. No.	Shield Wire Type	Qty
01.	7/8 SWG (7/4.00 mm steel)	20 km
02.	7/9 SWG (7/3.66 mm steel)	100 km

1.3 TESTS

Acceptance and routine test shall be performed by the vendor for each order.

1.4 MANDATORY TYPE TESTS

Bidder shall also indicate the test charges for conducting the following **Type test:**

a) UTS test) As per Clause 2.10.1
b) DC resistance test) As per Clause 2.10.2

SECTION II

STANDARD SPECIFICATION

2.0 GENERAL

This section covers the standard technical specification for GI Shield Wire.

TECHNICAL REQUIREMENTS:

Sl.No	Parameter	7/8 SWG	7/9 SWG
1	Stranding and wire diameter	7/4.0 mm steel	7/3.66 mm steel
2	Strand Arrangement		
	Steel core	1	1
	Outer Steel Layer	6	6
3	Total sectional area	90.62 mm2	73.65 mm2
4	Overall diameter	12.0 mm	10.98 mm
5	Approximate weight	687 kg/km	583 kg/km
6	Calculated d.c. resistance at 200	2.09 ohms/km	2.5 ohms/km
7	Minimum ultimate tensile strength	77.7 kN	68.4 kN
8	Direction of lay of outer layer	Right hand	Right hand
9	Standard Drum Length	250/500/1000/2000/4000 meter	
10	Protective coating for storage	Boiled linseed oil to avoid wet storage stains.	

2.1 EQUIPMENT SPECIFICATION

This section covers the general technical requirements of the Galvanised Steel Wire. In case of any discrepancies between the requirements mentioned in this section and those specified in other sections of this specification, this shall prevail after Section 1 and shall be treated as binding requirements.

2.2 APPLICABLE STANDARDS

The Galvanised Steel Wire shall strictly conform to the following Indian and International standards, as appropriate:

IS: 521(1991)	Method for tensile testing of steel wire
ISO/R89-1959	
IS: 1778-1980	Reels and drums for bare conductors
IS: 2629(1990)	Recommended practice for hot dip galvanizing on iron and steel.
IS: 2633(1992)	Method for testing uniformity of coating of zinc-coated articles
IS: 4826(1992)	Hot dip galvanized coatings on round steel wires
ASTMA-475-72a	
IS: 6745 (1990)	Methods for determination of mass of Zinc coating on zinc- coated iron and steel articles

IS: 209(1992) Zinc ingot
IS 398 (Parts-I to V): 1992 Aluminium conductors for Overhead transmission purposes

2.3 TECHNICAL REQUIREMENT AND CONSTRUCTIONAL DETAILS

2.3.1 The galvanized steel stranded wire shall generally conform to the specification of ACSR core wire as mentioned in IS 398 (Part- II):1976 except where otherwise Specified herein.

2.4 WORKMANSHIP

2.4.1 All steel strands shall be smooth, uniform and free from all imperfections, such as spills and splits, die marks, scratches, abrasions and kinks after drawing and also after stranding.

2.4.2 The finished material shall have minimum brittleness as it will be subjected to appreciable vibration while in use.

2.4.3 The steel strands shall be hot dip galvanized (and shall have a minimum zinc coating of 275 g/m^2) after stranding of the uncoated wire surface. The zinc coating shall be smooth, continuous, of uniform thickness, free from imperfections and shall withstand three and a half dips after stranding in standard Preece test. The steel wire rod shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands shall be of uniform quality and have the same properties and characteristics in ASTM designation B498-74.

2.4.4 The steel strands shall be preformed and post-formed in order to prevent spreading of strands while cutting of composite stranded wire. Care shall be taken to avoid damage to galvanization during pre-forming and post-forming operation.

2.4.5 To avoid susceptibility towards wet storage stains (white rust), the finished material shall be provided with a protective coating of boiled linseed oil.

2.5 JOINTS IN WIRES

There shall be no joint of any kind in the finished steel wire strand entering into the manufacture of the stranded wire. There shall be no strand joints or strand splices in any length of the completed stranded wire.

2.6 TOLERANCE

The manufacturing tolerances to the extent of the following limits only shall be permitted in the diameter of the individual steel strands and lay length of the stranded wire:

	Standard	Maximum	Minimum
Diameter	3.66mm	3.75mm	3.57mm
Lay length	181mm	198mm	165mm

2.7 MATERIALS

2.7.1 Steel

The steel wire strands shall be drawn from high carbon steel rods and shall conform to the following requirements as to the chemical composition:

Element	% Composition
Carbon	Not more than 0.55
Manganese	0.4 to 0.9
Phosphorous	Not more than 0.04
Sulphur	Not more than 0.04
Silicon	0.15 to 0.35

2.7.2 Zinc

The zinc used for galvanizing shall be electrolytic High Grade Zinc of 99.95% purity. It shall confirm to and satisfy all the requirements of IS: 209-1979

2.8 STANDARD LENGTH

2.8.1 The stranded wire shall be supplied in standard drum lengths generally in the range of 250/500/1000/2000/4000 m. However, drum lengths where required to be supplied in lengths different from standard lengths specified above shall be provided.

2.9 TESTS

2.9.1 The G.S. Wire should have been type tested as per IEC/IS and shall be subjected to routine and acceptance tests in accordance with applicable IS specifications/ ISO/ ASTMA recommendations. Type test reports of the tests conducted earlier (not more than five years earlier) on similar material shall be submitted. If the valid type test reports are not available with the bidder then the tests shall be conducted by the bidder free of cost.

2.9.2 If the purchaser insists to carry out the type test(s) afresh, the same shall be conducted on chargeable basis, for that the bidder shall submit the test charges in the price bid.

2.9.3 TYPE TESTS

In accordance with the stipulation of the specification the following type tests shall be conducted on the stranded wire.

a) UTS test) As per Clause 2.10.1
b) DC resistance test) As per Clause 2.10.2

2.9.4 ACCEPTANCE TESTS

a) Visual check for joints, scratches etc. and length of stranded wire (As per Clause 2.10.3)
b) Dimensional check(As per Clause 2.10.5)
c) Galvanizing test (As per Clause 2.10.7)
d) Lay length check (As per Clause 2.10.6)

e) Torsion test (As per Clause 2.10.4)
f) Elongation test (As per Clause 2.10.4)
g) Wrap test
h) DC resistance test (IS 398(Part-III))1976
i) Breaking load test (IS 398(Part-III))1976
j) Chemical Analysis of steel (IS 398(Part-III))1976)

2.9.5 ROUTINE TESTS

a) Check that there are no cuts, fins etc. on the strands.
b) Check for correctness of stranding.

2.9.6 TESTS DURING MANUFACTURE

a) Chemical analysis of zinc used for galvanizing (As per Clause 2.10.8)
b) Chemical analysis of steel (As per Clause 2.10.9)

2.9.7 SAMPLE BATCH FOR TYPE TESTING

The Contractor shall offer material for sample selection for type testing, only after getting quality assurance program approved by the Owner. The samples for type testing shall be manufactured strictly in accordance with the quality Assurance Program approved by the Owner.

2.10 TESTING PROCEDURE FOR STRANDED GALVANISED STEEL WIRE

2.10.1 UTS Test

Circles perpendicular to the axis of the stranded wire shall be marked at two places on a sample of stranded wire of minimum 5 m length suitably compressed with dead end clamps at either end. The load shall be increased at a steady rate up to 34 kN and held for one minute. The circles drawn shall not be distorted due to relative movement of strands. Thereafter, the load shall be increased at a steady rate of 68.4 kN and held for one minute. The stranded wire sample shall not fail during this period. The applied load shall then be increased until the failing load is reached and the value recorded.

2.10.2 D.C Resistance Test

On a stranded wire sample of minimum five metres length, two contact clamps shall be fixed with a pre-determined Bolt torque. The resistance shall be measured by a Kelvin double-bridge by placing the clamps initially zero meter and subsequently one meter apart. The test shall be repeated at least five times and the average value recorded. The value obtained shall be corrected to the value at 20^0C shall conform to the requirements of this specification.

2.10.3 Visual Check for Joints, Scratches etc. and length of Stranded wire

Stranded wire drums shall be rewound in the presence of the inspector. The inspector shall visually check for scratches, joints, etc. and see that the stranded wire generally conforms to the requirements of this specification. The length of stranded wire wound on the drum shall be measured with the help of counter meter during rewinding.

2.10.4 Torsion and Elongation Tests

The test procedures shall be as per relevant clause of IS 398 (Part V). The minimum number of twists which a single steel strand shall withstand during torsion test shall be eighteen for a length equal to 100 times the standard diameter of the strand In case the test sample length is less or more than 100 times the standard diameter of the strand, the minimum number of twists will be proportionate to the length and if number comes in the fraction then it will be rounded off to next higher whole number. In elongation test, the elongation of the strand shall not be less than 64% for a gauge length of 200 mm.

2.10.5 Dimensional Check

The individual strands shall be dimensionally checked to ensure that they conform to the requirements of this specification.

2.10.6 Lay Length Check

The lay length shall be checked to ensure that they conform to the requirements of this specification.

2.10.7 Galvanizing Test

The test procedure shall be as specified in IS: 4826-1968. The material shall conform to the requirements of this specification.

2.10.8 Chemical Analysis of Zinc used for Galvanizing

Samples taken from the zinc ingots shall be chemically/spectrographically analyzed. The same shall be in conformity to the requirements stated in this specification.

2.10.9 Chemical Analysis of Steel

Samples taken from the steel ingots/coils/strands shall be chemically/ spectrographically analyzed. The same shall be in conformity to the requirements stated in this specification.

2.11 Following drawings/ documents shall be submitted for approval/ information for each project:

i) Guaranteed and other technical particulars
ii) Drum Drawing
iii) Type, Acceptance, sample and routine test reports

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SECTION – 3

PROJECT INFORMATION AND GENERAL TECHNICAL REQUIREMENTS

INDEX

CHAPTER 1

PROJECT SYNOPSIS

1.0 GENERAL BACKGROUND AND SALIENT FEATURES

1.1 Introduction

Tamilnadu Generation and Distribution Corporation owns the proposed green-field 1320 MW (2 units of 660 MW each) Coal Based Thermal Power Station at Katupalli. This is an expansion of North Chennai Thermal Power Station (NCTPS) and located on some portion of the ashdyke of NCTPS.

1.2 Location

The proposed site for main power plant is located near Ennore port (approx 5 kms).
The nearest Railway station is at Athipattu Pudunagar (approx 5 kms)
All weather road from Pattamandri on the Thiruvottiyur-Ponneri district highway is the nearest road access.
The nearest airport is at Chennai at a distance of 60 km.

1.3 NA

1.4 PROJECT INFORMATION

Project Title : **2 x 660 MW Ennore SEZ Coal Based Supercritical Thermal Power Project at Ash Dyke of NCTPS**

Owner : **TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)**

LOCATION

The site is located near Vayalur Village, Ennore

Latitude	:	$13^0$17' N to $13^0$18' N
Longitude	:	$80^0$18' E to $80^0$19' E
Distance from Chennai City	:	35 km
Nearest Airport is at Chennai at a Distance of	:	60 km
Nearest Seaport is	:	Ennore
Nearest Railway Station is	:	Athipattu Pudunagar (approx 5 kms)

Meteorological Condition

Climate : Tropical ,very dry and hot summer, dry and cold winter and good rain-fall in monsoon accompanied with strong wind.

Climatological data	:		
Ambient temp. (^{0}C)	:	Annual Maximum Mean Temp	41.5(^{0}C)
		Annual Minimum Mean Temp	24(^{0}C)
		Design Ambient temperature	**50(^{0}C)**
Relative Humidity	:	Maximum 100% Minimum 36% Design 75%	
Annual Rainfall	:	Maximum 2540 mm Average 1600 mm Minimum 1175 mm	
Prevailing Wind Direction	:	Nov to Jan – From NW & NE Feb to Mar – From East & SE Apr to May – From South & SE June – From SW July to Aug – From NW Sept to Oct – From SE & SW Wind Speed 11.8 kmph (avg) 50 kmph (max)	
Seismic Zone	:	Seismic Zone III as per IS:1893-2002	

		minimum 0.16 g horizontal	

1.5

1.7 Access to Site

Site is well connected to all weather road from Pattamandri on the Thiruvottiyur – Ponneri district highway. Site is located adjacent to the Chennai – Howrah broad gauge line and thus well connected by rail also.

CHAPTER – 2

GENERAL TECHNICAL REQUIREMENTS

1.00.00 ELECTRICAL SYSTEM PARTICULARS

1) Standard voltage levels

The standardized voltage levels as shall be adopted as specified elsewhere in this specification.

2) Permissible variations:

The system unit/plant equipment shall be designed suitable for continuous operation with variation in voltage and frequency as indicated below:

3) <u>Variation in voltage and frequency</u>

	Voltage	**Frequency**
Permissible variation for power supply with rated Performance /rated current and control effectiveness maintained	+/- 10%	-5% to +3%
Permissible variation for control and regulation equipment with rated Performance and control quality maintained		

4) **Basic insulation levels**

Equipment shall be designed suitable for basic insulation levels as given below:

Nominal Voltage (kV)	**BIL kV (peak)**
400 kV	1425
33 kV	170
11 kV	75
3.3 kV	40

5) **Symmetrical short circuit ratings**

The three phase symmetrical short circuit ratings of the switchgear at different voltage levels shall be as indicated in the Table below:

S. No.	Voltage level	Symmetrical Breaking Capacity	Making Capacity
1.	400 kV	63 kA for 1 sec	163 kA
2.	33 kV	25 kA for 3 sec	62.5 kA
3.	11 kV	50 kA for 3 sec	125 kA
4.	3.3 kV	40 kA for 3 sec	100 kA
5.	415 V	50 kA for 1 sec	125 kA
6.	220 V DC	25 kA for 1 sec	-
7.	48 V DC	10 kA for 1 sec	

6) Criteria for selection of voltage levels for motors

Sr. No	Rating	Voltage Level
1	LV Motors- Up to 160 kW	415 V, 3 phase, 50 Hz
2	MV Motors- More than 160 kW and up to 1500 kW	3.3 kV, 3 phase, 50 Hz
3	HV Motors- Above 1500 kW	11 kV, 3 phase, 50 Hz

7) System Earthing

i. 33kV/11 kV and 3.3 kV : Resistance grounded.
ii. 415 V : Solidly grounded.

8) Degree of Protection:

Degree of protection for various electrical equipment shall be as follows:

S.No.	Equipment	Degree of Protection
1.	Marshalling Boxes, Panels, Motors located outdoor	IP55
2.	Electrical Equipment of CH System	IP55 with dust proof enclosure
3.	HV Switchgear	IP-4X for bus bar chamber, IP-6X for other compartments
4.	LV Switchgear	IP52 up to 1600 A and IP42 above 1600 A

2.00.00 GENERAL TECHNICAL PARTICULARS FOR EHV SYSTEM

(a)	Rated voltage	400 kV
(b)	Rated frequency	50 Hz
(c)	Rated short time current withstand capacity	63 kA rms for one (1) second
(d)	Rated one minute power frequency withstand voltage	650 kV rms between live terminals and earth b) 815 kV rms across isolating distance
(e)	Rated lightning impulse withstand voltage	a) 1425 kVp between live terminals b) 1425 (+240) kVp across isolating distance & earth.
(f)	Rated Switching Impulse withstand voltage	a) 1575 kVp (between phases) b) 900 (+345) (across isolating distance)
(g)	Phase to phase spacing	4000 mm
(h)	Rated terminal load	Adequate to withstand 100 kg static load as well as wind, seismic and short circuit forces without impairing reliability or current carrying capacity.
(i)	System neutral earthing	Effectively earthed
(j)	Support structure height	Adequate so that lowest part of support insulator of equipment is 2550 mm (minimum) from ground and/or plinth level.
(k)	**Creepage distance**	**Minimum 31 mm / kV**
(l)	Electrical Clearances	

Clearances shall be as given below and as per relevant statutory rules/codes.		
1.	Phase to earth	3500 mm
2.	Phase to phase	4000 mm
3.	Sectional clearance	6500 mm
4.	Ground clearance	8000 mm

3.00.00 NA

4.00.00 COMPLETENESS

4.01.00 Bidders may note that this is a contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure that a completely engineered plant is provided.

4.02.00 All equipment furnished by the Bidder shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation & maintenance of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.

All similar standard components/ parts of similar standard equipment provided, shall be interchangeable with one another.

5.00.00 CODES & STANDARDS

5.01.00 In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following:

(a.) Bureau of Indian Standards (BIS)

(b.) Indian electricity act

(c.) Indian electricity rules

(d.) Indian Explosives Act

(e.) Indian Factories Act and State Factories Act

(f.) Indian Boiler Regulations (IBR)

(g.) Regulations of the Central Pollution Control Board, India

(h.) Regulations of the Ministry of Environment & Forest (MoEF), Government of India

(i.) Pollution Control Regulations of Department of Environment, Government of India

(j.) State Pollution Control Board.

(k.) Rules for Electrical installation by Tariff Advisory Committee (TAC).

(l.) Any other statutory codes / standards / regulations, as may be applicable.

5.02.00 Unless covered otherwise by Indian codes & standards and in case nothing to the contrary is specifically mentioned elsewhere in the specifications, the latest editions (as applicable as on date of bid opening), of the codes and standards given below shall also apply:

(a.) Japanese Industrial Standards (JIS)

(b.) American National Standards Institute (ANSI)

(c.) American Society of Testing and Materials (ASTM)

(d.) American Society of Mechanical Engineers (ASME)

(e.) American Petroleum Institute (API)

(f.) Standards of the Hydraulic Institute, U.S.A.

(g.) International Organisation for Standardization (ISO)

(h.) Tubular Exchanger Manufacturer's Association (TEMA)

(i.) American Welding Society (AWS)

(j.) National Electrical Manufacturers Association (NEMA)

(k.) National Fire Protection Association (NFPA)

(l.) International Electro-Technical Commission (IEC)

(m.) Expansion Joint Manufacturers Association (EJMA)

(n.) Heat Exchange Institute (HEI)

5.03.00 Other International/ National standards such as DIN, VDI, BS, etc. shall also be accepted for only material codes and manufacturing standards, subject to the Owner's approval, for which the Bidder shall furnish, alongwith the offer, adequate information to justify that these standards are equivalent or superior to the standards mentioned above. In all such cases the Bidder shall furnish specifically the variations and deviations from the standards mentioned else

where in the specification together with the complete word to word translation of the standard that is normally not published in English.

~~5.04.00 NA~~

5.05.00 ~~NA~~

5.06.00 NA

5.07.00 In case of any change in codes, standards & regulations between the date of bid opening and the date when vendors proceed with fabrication, the Owner shall have the option to incorporate the changed requirements or to retain the original standard. It shall be the responsibility of the Bidder to bring to the notice of the Owner such changes and advise Owner of the resulting effect.

6.00.00 EQUIPMENT FUNCTIONAL GUARANTEE

6.01.00 The Equipment and Auxiliaries shall be capable of continuous operation in frequency range of 47.5 to 51.5 Hz.

DRAWING DOCUMENT SUBMISSION

4.1 DISCREPANCIES BETWEEN DRAWING AND SPECIFICATION:

Should there be any discrepancy between the specifications and/or schedule of prices and/or drawings or any inconsistency, error or omission in either of them, reference must be made to the BHEL/CUSTOMER for an explanation and the Supplier will be held responsible for any errors that may occur in the work through neglect of this precaution. The explanation of the BHEL/CUSTOMER shall be final and binding on the Supplier.

4.2 APPROVAL PROCEDURE

The scheduled dates for the submission of drawings as well as for, any data/information to be furnished by the Employer would be as per the following schedule. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed generally for approval.

i.	First Submission	Within 7 days from the date of LOI/PO
ii.	Approval/comments/by employer on Initial submission	Reasonable time
iii.	Resubmission	Within 7 days (whenever from date of comments required) Including both ways postal time.
iv.	Approval or comments	Within 2 weeks of receipt of resubmission.
v.	Furnishing of distribution copies	2 weeks from the date of last approval.

Note: The supplier may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

The title block of drawings shall contain the following information incorporated in all contract drawings. Please refer enclosed sheet for details of Title block.

4.3 TITLE BLOCK

Following Title Blocks to be used in drawings at the time of drawing approvals

Project:	400kV GIS at 2 x 660 MW Ennore SEZ Supercritical Thermal Power Project at Ash Dyke of NCTPS, Chennai-120
NOA No:	CE/P/SE/M/P/EE-10/E/P/F.2X660MW ENNORE SEZ STTP/D60/DT 27.027.2014
Customer :	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION (TANGEDCO)
Consultant	DESEIN PRIVATE LIMITED,NEW DELHI
Contractor	BHARAT HEAVY ELECTRICALS LIMITED

4.4 DOCUMENTS TO BE SUBMITTED ALONG WITH OFFER

1) **Drawings**
2) **Guaranteed Technical Particulars**
3) **Type Test Reports**
4) **List of Part Supplies with rating**

Drawings & Documents submitted at the time of offer shall be subject to review at contract stage.

4.5 DOCUMENTATION SCHEDULE

Following Documentation schedule to be followed per project.

S. No.	DESCRIPTION	TENDER STAGE	**CONTRACT STAGE FOR APPROVAL**	FINAL DOCUMENTATION	
			Hard Copy / Prints	**Hard Copy / Prints**	CDs
1	Drawings and Data Sheets	1	**7**	10	5
2	Drawings "As Built "	-	**-**	10	
3	Type Test Reports	1	**7**	10	
4	Erection Manuals	-	**7**	10	
5	Operation and Maintenance Manuals	-	**7**	10	
6	Manufacturing Quality Plan	-	**7**	10	
7	Field Quality Plan	-	**7**	10	

8	Inspection Test Reports	-	**7**	10	

Supplier to submit Hard copies of the drawing to following address

To,
<Name of BHEL's concerned engineering official>
Bharat Heavy Electricals Limited
Transmission Business Group- Engineering Management
Advant Navis IT Business Park
Plot No.-7, Greater Noida Expressway,
Sector 142, **NOIDA**, Uttar Pradesh 201305

Note: Drawings will also be submitted in CD/DVD in Latest AUTOCAD version or any other CAD package along with conversion files for all major items.

Final Documentation shall be submitted in bound volumes with details of Customer & Project etc. written on top.

SECTION – IV

GUARANTEED AND TECHNICAL PARTICULARS OF STRANDED G. S.WIRE

S. No.	Description	Unit	Particulars
1.	**Name & Address of manufacturer**		
2.	**Particulars of raw materials**		
2.1	Aluminium		
	a) Minimum Purity of Aluminium	%	
	b) Maximum Copper Content	%	
2.2	Steel wires/Rods		
	a) Carbon	%	
	b) Manganese	%	
	c) Phosphorous	%	
	d) Sulphur	%	
	e) Silicon	%	
2.3	Zinc		
	a) Minimum purity of Zinc	%	
3.	**STEEL STRANDS BEFORE STRANDING**		
3.1	Diameter		
	a) Nominal	mm	
	b) Maximum	mm	
	c) Minimum	mm	
3.2	Minimum breaking load of strand	kN	
3.3	Maximum Resistance of 1 M Length of strand of 20°C	Ohm	
4.0	**STEEL STRANDS AFTER STRANDING**		
4.1	a) Nominal Diameter	mm	
	b) Maximum Diameter	mm	
	c) Minimum Diameter	mm	
4.2	Minimum breaking load of strand	kN	
4.3	Galvanising		
	a) Min. weight of zinc coating of uncoated wire surface	g/ m^2	
	b) Min. number of one minute dips that the galvanised strand can withstand in the standard Preece test	Nos.	
	c) Min. No. of twists in gauge length equal to 100 times the dia of wire which the strand can withstand in the torsion test	Nos.	
5.	**COMPLETED STRANDED WIRE**		
5.1	UTS of stranded wire	kN	
5.2	Lay length of outer steel layer	mm	
5.3	DC resistance of stranded wire at 20°C	Ω/km	
5.4	Direction of lay of outer layer	-	
5.5	Linear mass of earth wire		
	a) Nominal	Kg/km	
	b) Maximum	Kg/km	
	c) Minimum	Kg/km	
6.0	Is drum as per I.S	Yes/No	
5.6	Standard length of stranded wire in the drum	m	

ANNEXURE – A

NO DEVIATION CERTIFICATE

It is confirmed that there is no deviation and the offer is in full compliance with the specification. It is also confirmed that there are no deviations in any other form such as comments, variations and or exceptions. Further it is confirmed that at all drawings/ data sheets/ QP/ type tests reports shall be submitted to BHEL for organizing approval of ultimate customer. Also, furnishing of all relevant information/ repetition of type tests (if required for meeting the specification requirement) shall be carried out by us at no extra cost to BHEL and without affecting delivery requirements.

Signature of the authorized representative of Bidder

Name _____

Designation _____

Place _____

Date _____

Company Seal