STANDARD MANUFACTURING QUALITY PLAN FOR SEVEN STRAND G S EARTH WIRE

Code 1	Indicates place where testing is planned to be performed i.e. inspection location
A	At Equipment Manufacturer's works (Earthwire Manufacturer)
B	At Component Manufacturer's works (Wire Rod Supplier)
C	At Authorised Distributor's place
D	At Independent Lab
E	At Turn Key Contractor's location
F	Not specified

Code 2	Indicates who has to perform the tests i.e. Testing Agency
J	The Equipment Manufacturer
K	The Component Manufacturer
L	The Third Party
M	The Turnkey Contractor

Code 3	Indicates who shall witness the tests i.e. Witnessing Agency
P	Component Manufacturer itself
Q	Component Manufacturer and Equipment Manufacturer
R	Component Manufacturer, Equipment Manufacturer and Contractor
S	Equipment Manufacturer itself
T	Equipment Manufacturer and Contractor
U	Equipment Manufacturer, Contractor and POWERGRID
V	Third Party itself

Code 4	Review of Test Report / Certificates.
W	By Equipment manufacturer during raw material / bought out component inspection
X	By Contractor during product / process inspection
Y	By POWERGRID during product / process inspection
Z	By Contractor and/or POWERGRID during product / process inspection

Code 5	Whether specific approval of sub-vendor / Component make is envisaged?
E	Envisaged
N	Not Envisaged

Code 6	Whether test records required to be submitted after final inspection for issuance of CIP /MICC
Y	Yes
N	No



NOTES/GENERAL REQUIREMENTS TO BE CHECKED/ENSURED

a) Proper co-relation of test certificates from raw material to finished GS Earth Wire for offered lot shall be maintained.

b) The equipment manufacturer shall carry out all the Routine tests for correctness of stranding, no cuts, fins etc. on the strands, drums are as per Specification

b) The Equipment Manufacturer will carry out the acceptance tests on steel strands on 10% of the drums offered for inspection and will submit the records at the time of final inspection. POWERGRID's Inspection Engineer will select 10% samples of drums offered for rewinding & acceptance testing & shall be witnessed by POWERGRID at Equipment Manufacturers works.

c) Equipment manufacturer shall obtain the following test certificates from POWERGRID approved sources for Steel wire rods / Zinc ingots used for review by POWERGRID.
   i) Chemical test certificate of Steel Wire Rod manufacturer
   ii) Test certificate of Zinc manufacturer
   iii) Test certificates of the tests carried out by steel wire rod manufacturer.

d) Top end of the earth wire in each drum are sealed with adhesive tamper proof sticker duly signed by POWERGRID Inspection Engineer. The earth wire ends are required to be sealed with heat shrinkable sleeves & POWERGRID lead seal and shall be properly secured with the drum with the help of "U" clamps (nail) on the side of the flange at three locations 75mm apart to avoid loosening of earth wire during transit and handling.

e) The following test equipments shall be calibrated by NABL accredited agencies and should be available at equipment manufacturer's works.
   i) All testing and measuring equipment.
   ii) Standard Resistance.

f) All drums to be marked with CIP/MICC number vide which the material has been cleared before dispatch.

g) In case of any contradiction between Technical Specification / Approved Drawing and MQP, the details mentioned in the Technical Specification / Approved Drawing shall be final. The MQP should be read in conjunction with the technical specification against which the Earth Wire has been manufactured

h) POWERGRID may review the effective implementation of the process during the product inspection / process inspection. In case any violation in process or process parameters are observed, the reason along with corrective & preventive measure shall be conveyed to POWERGRID.

i) The manufacturer should progressively align their Quality System and sub-vendors Quality System to the requirements of ISO 9000 series Quality Standards and in due course of time should get their quality system certified to ISO 9001.

j) All relevant IS standards shall be read along with the latest amendments.

k) The size of the earthwires & test parameters shall be as per GTP/TS.

l) Finished earthwire shall be checked for length verification and surface finish on separate rewinding machine at variable speed from 8 to 16 mtr/ minute.
The rewinding facilities shall have appropriate clutch system and shall be free from vibration and jerks etc. with traverse laying facilities.
If length is found less than declared length during rewinding, then two drums from the same lot shall be verified for declared length. In case any of these drums is found have less length, the lot will be rejected otherwise lot shall be accepted with the actual length restricted to declare length. In case of defects in surface finish, additional two drums shall be taken for rewinding & if same problem is observed the entire lot shall be rejected.

m) Rejection & retests shall be as per IS 398.

n) The drums shall be suitable for wheel mounting and letting off the conductor under an minimum controlled tension of the order of 5 KN.

o) The inner cheek of the flanges & drum barrels surface shall be painted with Bitumen based paint. Before reeling, thick bituminized water proof bamboo paper shall be secured on the drum barrel and inside of the flanges of drum. After reeling the conductor, the exposed surface of the outer layer of the conductor shall be wrapped with water proof thick bituminised bamboo paper & then transparent plastic sheet.

Section : RAW MATERIAL INSPECTION

Sl. No.	Components / Operations & Description of Test	Type of Check	Quantum of Check/ Sampling with basis	Reference Document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1	**HIGH CARBON STEEL WIRE ROD**										E		
1.1		Chemical Analysis	1 Sample per heat per lot	IS-7904 & POWERGRID Specn.	% C - 0.55 max. % Mn – 0.40 to 0.90 % Si – 0.15 to 0.35 % S – 0.04 max. % P – 0.04 max.	Supplier TC	B	K	P	Z	-	N	
			4 Samples per consignment (24MT approx.)			Manufacturer Format of Record (MFOR)	A	J	S	Z		N	
1.2		Diameter of wire rod and ovality	1 Sample per heat per lot	IS 7904 and Manufacturer's plant standard	IS 7904 and Manufacturer's plant standard	Supplier TC	B	K	P	Z	-	N	
			4 Samples per consignment (24MT approx.)			MFOR	A	J	S	Z		N	
1.3		Ultimate Tensile Strength	1 Sample per heat per lot	-do-	-do-	Supplier TC	B	K	P	Z	-	N	
			4 Samples per consignment (24MT approx.)			MFOR	A	J	S	Z		N	
1.4		Percentage reduction of area	1 Sample per heat per lot	-do-	-do-	Supplier TC	B	K	P	Z	-	N	
			4 Samples per consignment (24MT approx.)			MFOR	A	J	S	Z		N	
1.5		Elongation	1 Sample per heat per lot	-do-	-do-	Supplier TC	B	K	P	Z	-	N	
			4 Samples per consignment (24MT approx.)			MFOR	A	J	S	Z		N	
1.6		Cleaniness & Surface Smoothness (Visual)	100% on each coil	IS 7904 & POWERGRID Specn.	The wire rod shall be round and free from fins, flaws and other harmful surface defects	MFOR	A	J	S	Z		N	

Section **: RAW MATERIAL INSPECTION**

Sl. No.	Components / Operations & Description of Test	Type of Check	Quantum of Check/ Sampling with basis	Reference Document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1.7		Micro Structures a) Structure	1 Samples per heat	IS 7904	The structure shall be fine perlite	Supplier TC	B	K	P	Z	- -	N	
		b) Grain Size	1 Samples per heat	IS 4748	Min – 6 @ 100 X	Supplier TC	B	K	P	Z	-	N	
		c) Inclusion Rating	1 Samples per heat	IS 7904 & IS 4163	Max – 2 Thick Series	Supplier TC	B	K	P	Z	-	N	
		d) Surface Defects	1 Samples per heat	IS 7904	Max – 1% of Dia	Supplier TC	B	K	P	Z	-	N	
		e) Decarbu-risation	1 Samples per heat	IS 7904 & IS 6396	Max – 1% of Dia	Supplier TC	B	K	P	Z	-	N	
2	ELECTROLYTIC ZINC										E		Records of suppliers test certificate are to be maintained.
2.1		Chemical Analysis	Supplier TC	IS 209 & POWERGRID Specn.	Purity 99.95 % Min	Supplier TC	B	K	P	Z	-	N	

Section **: INPROCESS INSPECTION**

Sl. No.	Components / Operations & Description of Test	Type of Check	Quantum of Check/ Sampling with basis	Reference Document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
3	**SURFACE PREPARATION**												
3.1	Pickling	chemical	1 Sample from pickling bath daily	IS 2629	IS 2629 / Manufacturer plant standard	MFOR	A	J	S	Z	-	N	
3.2	Surface Coating	Chemical	1 Sample from the bath daily	IS 2629	Manufacturer plant standard	MFOR	A	J	S	Z	-	N	
4	**DRAWING OF STEEL WIRE ROD TO WIRE (BLACK)**												
4.1		Surface finish (Visual Check)	100% on each coil	IS 398 Part II and POWERGRID Specn	IS 398 Part II and POWERGRID Specn	MFOR	A	J	S	Z	-	N	
4.2		Diameter	20% coil drawn from each wire rod	Plant Standard	Plant Standard	MFOR	A	J	S	Z	-	N	
4.3		Breaking Load / Tensile Test	20% coil drawn from each wire rod	Plant Standard	Plant Standard	MFOR	A	J	S	Z	-	N	
4.4		Torsion	20% coil drawn from each wire rod	Plant Standard	Plant Standard	MFOR	A	J	S	Z	-	N	
4.5		Wrapping Test	20% coil drawn from each wire rod	Plant Standard	Plant Standard	MFOR	A	J	S	Z	-	N	
4.6		Joints	100% on each coil	POWERGRID Spec.	No joints allowed	MFOR	A	J	S	Z	-	N	

Section **: IN PROCESS INSPECTION**

Sl. No.	Components / Operations & Description of Test	Type of Check	Quantum of Check/ Sampling with basis	Reference Document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
5.	**GALVANISING**	Molten Zinc bath temperature	Every 2 Hour	IS 2629	Min – 440 °C Max – 460 °C	MFOR	A	J	S	Z	-	N	Galvanizing process as per IS 2629 & Plant standard
		Chemical Analysis of molten zinc from bath	1 Sample in 30 days	IS 209	IS 209	Independent lab test report	D	L	V	Z	-	N	
6	**Finished Galvanized Steel wire**	Surface smoothness (Visual Check)	100% on each coil	IS 398 Pt 2 & Plant Standard	IS 398 Pt 2 & Plant Standard	MFOR	A	J	S	Z	-	N	
6.1		Diameter	1 sample from every 10 coils	IS 398 Pt 2 & Plant Standard	IS 398 Pt 2 & Plant Standard	MFOR	A	J	S	Z	-	N	
6.2		Breaking Load / Tensile Test	1 sample from every 10 coils	IS 398 Pt 2 & Plant Standard	IS 398 Pt 2 & Plant Standard	MFOR	A	J	S	Z	-	N	
6.3		% Elongation	1 sample from every 10 coils	IS 398 Pt 2 & Plant Standard	IS 398 Pt 2 & Plant Standard	MFOR	A	J	S	Z	-	N	
6.4		Torsion	1 sample from every 10 coils	IS 398 Pt 2 & Plant Standard	IS 398 Pt 2 & Plant Standard	MFOR	A	J	S	Z	-	N	
6.5		Wrapping Test	1 sample from every 10 coils	IS 398 Pt 2 & Plant Standard	IS 398 Pt 2 & Plant Standard	MFOR	A	J	S	Z	-	N	

Section **: IN PROCESS INSPECTION**

Sl. No.	Components / Operations & Description of Test	Type of Check	Quantum of Check/ Sampling with basis	Reference Document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
6.6		Preece Test	1 sample from every 10 coils	IS 398 Pt 2 & IS 4826	IS 398 Pt 2 & IS 4826	MFOR	A	J	S	Z	-	N	
6.7		Weight of Zinc coating	1 sample from every 10 coils	IS 398 Pt 2 & IS 4826	IS 398 Pt 2 & IS 4826	MFOR	A	J	S	Z	-	N	
6.8		Adhesion Test	1 sample from every 10 coils	IS 398 Pt 2 & IS 4826	IS 398 Pt 2 & IS 4826	MFOR	A	J	S	Z	-	N	
6.9		Joints	100% on each coil	POWERGRID Specn.	No Joint allowed	MFOR	A	J	S	Z	-	N	
6.10		DC Resistance test	1 sample from every 10 coils	Plant Standard	Plant Standard	MFOR	A	J	S	Z	-	N	

Section **: IN PROCESS INSPECTION**

Sl. No.	Components / Operations & Description of Test	Type of Check	Quantum of Check/ Sampling with basis	Reference Document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
7	**STRANDING**												
7.1		Lay Length / Direction & Compactness	100 %	POWERGRID Specn.	As per GTP	MFOR	A	J	S	Z	-	N	
7.2		Overall Dia of stranded Earth Wire	1 Sample from each drum	POWERGRID Specn.	GTP/ IS 398 Pt 2	MFOR	A	J	S	Z	-	N	
7.3		Pre forming and Post forming of Earth Wire	100%	POWERGRID Specn.	No spreading when cut	MFOR	A	J	S	Z	-	N	
7.4		Standard Length	100%	POWERGRID Specn.	2000±5 % mtr	MFOR	A	J	S	Z	-	N	
7.5		Joints	100%	POWERGRID Specn.	No Joints allowed	MFOR	A	J	S	Z	-	N	
7.6		Check for Linseed oil application	100% on all drums	POWERGRID Specn.	100% Oil Coating	MFOR	A	J	S	Z	-	N	
7.7		Surface Cleanliness (Visual Check)	100%	POWERGRID Specn.	100% Clean Surface	MFOR	A	J	S	Z	-	N	

Section : FINAL INSPECTION & TESTING

Sl. No.	Components / Operations & Description of Test	Type of Check	Quantum of Check/ Sampling with basis	Reference Document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
10	**WOODEN DRUM**												
10.1		Dimension	1 Sample from every 10 drums or part thereof	IS 1778 & approved drawings	As per IS 1778 & approved drawings, POWERGRID Spec.	MFOR	A	J	U	Z		Y	CIP
10.2		Barrel batten strength	1 Sample from every 10 drums or part thereof	IS 1778 & approved drawings	Approved drawing	MFOR	A	J	U	Z		Y	CIP

Section **: PACKING & DESPATCH**

Sl. No.	Components / Operations & Description of Test	Type of Check	Quantum of Check/ Sampling with basis	Reference Document for Testing	Acceptance Norms	Format of Record	Applicable Codes						Remarks
							1	2	3	4	5	6	
11	**Checks during Packing**												
11.1		Proper packing	100%	POWERGRID Specn.	As per POWERGRID Specn.	MFOR	A	J	S / U *	Z	-	Y	CIP *10% by POWERGRID & 100% by earthwire manufacturer
11.2		LOA No on Drum											
12.3		Manufacturer's name and address											
12.4		Name and address of the consignee											
12.5		Drum No.											
12.6		Size of earth wire											
12.7		Length of earth wire in meters											
12.8		Gross weight with earth wire & lagging											
12.9		Weight of empty drum with lagging											
12.10		Arrow marking for unwinding											
12.11		Position of the earth wire											
12.12		Distance between outermost layer of earthwire & inner surface of lagging (min. 50 mm)											
12.13		Sealing of earth wire in each drum by a) Plain heat shrinkable sleeve at both ends. b) Lead sealing with POWERGRID plier at both ends. c) Adhesive tamper proof sticker indicating drum number duly signed by POWERGRID Inspection Engineer at both ends of earthwire.	100%	POWERGRID Specn.	As per POWERGRID Specn.	MFOR	A	J	U	Z		Y	CIP