



## Standard Manufacturing Quality Plan

For

### Galvanized Tower Structures/Parts

(MQP no. CC/QA&I/MQP/Standard/Tower Parts Rev 06)

Valid from 16-10-2024 to 15-10-2027

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Instructions for Code Allocation



Code 1	Indicate place where testing is planned to be performed i.e. Inspection Location A At Equipment Manufacturer's works (Transmission Line Tower Manufacturer) B At Component Manufacturer's works (Re-Roller/Plate Manufacturer) C At Authorised Distributor's works D At Independent Lab E At Turn Key Contractor's location F Not specified	Code 2	Indicate 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	Indicate who shall witness the tests i.e. Witnessing Agency P Component Manufacturer Q Component Manufacturer and Equipment Manufacturer R Component Manufacturer, Equipment Manufacturer and Contractor S Equipment Manufacturer T Equipment Manufacturer and Contractor U Equipment Manufacturer and/or Contractor and POWERGRID V Third Party	Code 4	Review of Test Reports/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:**

1	The MQP should be read in conjunction with POWERGRID specification and shall deem to include additional tests, if any required as per the contract.
2	POWERGRID specification shall include provisions of letter of Award, POWERGRID approved drawings / Technical Data Sheet / BOM / Test Schedule / Test Procedure applicable to the specific contract.
3	In case of any contradiction between MQP and POWERGRID Technical specification/Approved Drawing, the Technical specifications/Approved Drawing of respective project shall have precedence over this MQP.
4	It is the responsibility of the manufacturer to ensure that this document is readily available at their works as well as at the works of their sub vendors in order to avoid any delay at the time of inspection.
5	For the steel sections procured from approved re-rollers of POWERGRID the POWERGRID approved SMQP for re-roller shall be adhered to.
6	All bought out components /fasteners to be procured from POWERGRID approved manufacturers as per their standard/respective manufacturing quality plan approved by POWERGRID/relevant IS and CIP clearance to be obtained.
7	Valid calibration certificates of various testing and measuring instrument / equipments from Labs, accredited as per ISO/IEC -17025 which operates in accordance with the requirements of ISO/IEC 17011 having full membership & MRA of ILAC/APLAC, shall be maintained.
8	In case of any test being carried out at the third party lab, the same should be accredited as per ISO/IEC -17025 which operates in accordance with the requirements of ISO/IEC 17011 having full membership & MRA of ILAC/APLAC
9	The manufacturer shall maintain the proper co-relation of test certificates from raw material stage to finished product stage and the records should be available during inspection by POWERGRID. In absence of proper correlation of test certificates of Raw Material, actual testing to be done during Final Inspection.
10	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.
11	All bent pieces shall be checked at the process of bending by a bend gauge made as per bend ratio/degree shown in the sketch of the item / mark no. On the stand, one piece is thoroughly checked with bend gauge and all other pieces are checked by comparison method and pieces are cleared for further process. If the holes are to be made near the bend line, the same shall be done after bending.
12	The sample pieces consumed in a testing shall be replenished by the manufacturer at the time of dispatch. If the offered material meets the quality requirements, CIP/MICC shall be issued for total quantity offered without deducting the weight of materials consumed in testing.
13	Grades of steel used as well as the relevant standards it is conforming to, shall be as per the approved Drawings/ BOM for the specific contract and the same shall be indicated in the offer list at the time of inspection.
14	Steel plates below 6mm size used for packing plates/packing washers, produced as per IS: 1079 (Grade-0) are also acceptable. However, if below 6mm size plate are used as load bearing plates viz gusset plates, joint splices etc. the same shall conform to IS : 2062 or equivalent standard. Flats of equivalent grade meeting mechanical strength/ metallurgical properties may also be used in place of plates for packing plates/ packing washers.
15	Dispatch of the inspected Tower Structures shall be done with each tower/ panel wise bundling in order to ensure availability of complete Tower parts without missing of any member at site.
16	Pieces of light sections to be wire bundled and those of heavy sections to be supplied loose. Stacking to have proper ventilation and kept inclined. Damage to galvanization coating to be avoided while handling. The manufacturer to ensure sequential supplies and other details as per POWERGRID Technical Specification
17	In case Tower parts are to be used at sub zero temperature, Impact testing at -20° C shall be carried out during final inspection in line with IS/POWERGRID TS.

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18	Welding procedure and Welder's performance qualification shall be done in line with approved Guideline (attached herewith), in case welding is involved at any stage of fabrication/erection.	
19	All Welding procedures, qualification of welders, operators and procedures, electrodes, preheat, notch toughness and minimum yield of the electrodes needs to be ensured in conformance with the requirements of the latest revision of American Welding Society Structural Welding Code (ANSI/AWS D1.1) or other equivalent National/International standards. Preheating shall be done according to the ANSI/AWS code or the steel producers' recommendations or both.	
20	All relevant standards shall be read along with the latest amendments.	
21	POWERGRID may review the effective implementation of the process during the product inspection/process inspection. In case of any violation in process or process parameters are observed, the reason along with corrective & preventive measure shall be conveyed to POWERGRID.	
22	Any addition /change in new vendor/design/process shall be submitted for review by POWERGRID and necessary change in MQP may be requested, if necessary.	
23	If any activity (for which manufacturer is already approved) is being outsourced due to some exigencies/ unforeseen circumstances, then prior approval from POWERGRID needs to be taken.	
24	If the manufacturer does not have facility for any process, then the same shall be carried out at POWERGRID approved sources/as per the prior approval of POWERGRID. All the tests/checks against this outsourced process shall remain the same as indicated against respective process and the applicable codes shall be A/B, J/K, S/P, W/Z, -N.	
25	Inspection of angle sections at black stage for galvanized tower structures/parts, irrespective of specific contract can be followed as detailed hereunder:	
25.1	The manufacturer may raise inspection call for angle section at black stage at re-roller's work against any one of the ongoing Contract.	
25.2	The manufacturer may fabricate the raw material, cleared under CAT –A CIP for a particular contractor, for any of its POWERGRID projects under execution.	
25.3	The manufacturer will maintain a separate register indicating splitting and swapping of material between different projects awarded to same contractor, which can be reviewed by POWERGRID inspection engineer. Separate register for each Contractor is to be maintained if the manufacturer is executing jobs for different contractor.	
25.4	The manufacturer as a contractor on whom POWERGRID has placed the contract, shall be allowed to split and swap material in black stage only, amongst its different ongoing contracts with POWERGRID, without any obligation to POWERGRID.	
25.5	The final inspection after fabrication and galvanizing, however, will continue to be contract wise and CIPs will be issued for each contract only.	
26	In case of any failure of samples during mechanical or chemical testing, retesting shall be carried out to nullify any possibility of error during sample preparation or testing. While selecting samples for retesting, one sample shall be taken from the very same section of Tower structure from which the original test sample was taken and another sample shall be selected from any other member (section of same size) in the offered lot. The lot of this particular section size shall be considered acceptable only if both the samples selected for retesting are conforming to acceptance parameters against the test performed. Else, following action shall also be taken .	
a)	<b>For Individual Calls:</b> Any sample(s) out of the selected samples (as per sampling plan) fails in mechanical or chemical testing.	Material corresponding to the failed section(s) shall be <b>rejected</b> . Further, samples of the section(s), from which samples were not selected earlier for testing, shall also be taken for testing.
b)	<b>Combined Calls</b> Any sample(s) out of selected samples for testing (after calls combination) fails in mechanical or chemical testing.	Material corresponding to the failed section(s) against all the inspection calls combined shall be <b>rejected</b> . Further, samples of the section(s), from which samples were not selected earlier for testing, shall also be taken for testing.
27	The manufacturer shall strip off galvanizing of rejected material before re-galvanizing in case the rejection is due to galvanizing defects.	
28	The manufacturer shall dispose off entire section rejected in physical testing by gas cutting or by machine cutting from any end of rejected mark number.	
29	Combined sampling shall be carried out based on the request of contractor/ sub-vendor ( TLT manufacturer), an undertaking/ letter (format attached) in this regard shall be taken from the contractor / sub-vendor (TLT Manufacturer).	

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Sl No.	Components/Operations & Description of Test	Type of check	Quantum of check/ Sampling with basis	Reference document for testing	Acceptance norms	Form of record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1	<b>RAW MATERIAL</b>												
1.1	<b>STRUCTURAL STEEL (ANGLE SECTIONS, PLATES)</b>												
1.1.1	Steel Plates and Angle sections shall be procured from POWERGRID approved Sources, For angle sections procured from approved re-rollers, specific manufacturer approval of POWERGRID for size and Grade of Angle sections shall be ensured along with CIP against every lot at re-roller's works, The acceptance norms shall be as per relevant standards indicated in TS/approved drawing/BOM. However, if different grade is mentioned in the Technical Specifications/approved drawings, acceptance norms shall be as per the relevant standards.												
1.1.2	<b>Mechanical Properties</b>												
1.1.2.1	Yield Stress	Mechanical	Plant Standard of Transmission Line Tower Structure Manufacturer	IS: 2062/Relevant Standard as mentioned in POWERGRID TS	IS: 2062/Relevant Standard as mentioned in POWERGRID TS	Plant Record	A	J	S	W/Z	Y	Applicable for only Grade B0/BR and C as specified in Bill of Material /Drawing or TS	
1.1.2.2	Ultimate Tensile Strength	Mechanical				Plant Record	A	J	S	W/Z	Y		
1.1.2.3	Percentage Elongation at 5,65√Area	Mechanical				Plant Record	A	J	S	W/Z	Y		
1.1.2.4	Bend Test	Mechanical				Plant Record	A	J	S	W/Z	Y		
1.1.2.5	Impact Test (if applicable)	Mechanical				Plant Record/Third Party Lab	A/D	J/L	S/V	W/Z	Y		
1.1.3	<b>Chemical properties</b>												
1.1.3.1	Chemical Analysis	Chemical	Plant Standard of Transmission Line Tower Structure Manufacturer	As per Chemistry enclosed at Annexure-I for each source/Relevant standards indicated in POWERGRID TS	As per Chemistry enclosed at Annexure-I for each source/Relevant standards indicated in POWERGRID TS	Plant Record/Third Party Lab	A/D	J/L	S/V	W/Z	Y		
1.1.4	<b>Visual Inspection</b>												
1.1.4.1	Visual	Visual	Plant Standard of Transmission Line Tower Structure Manufacturer	Relevant Standard as mentioned in POWERGRID TS	Material to be free from surface defects like laminations, rough/jagged and imperfect edges, cracks, rounded apex, deep roll marks, pipy and any harmful defects	Plant Record	A	J	S	W/Z	Y		


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1.1.5	<b>Dimensional Inspection</b>													
1.1.5.1	<b>Angle Sections</b>													
1.1.5.1.1	Tolerances For Leg Length of Angles Equal / Un Equal	Measurement	Plant Standard of Transmission Line Tower Manufacturer	IS 1852/ IS 808/ POWERGRID Spec	As per relevant IS standards	Plant Record	A	J	S	W/Z		Y		
1.1.5.1.2	Out of Square ness	Measurement		IS 1852/ POWERGRID Spec		Plant Record	A	J	S	W/Z		Y		
1.1.5.1.3	Camber	Measurement		IS 1852/ POWERGRID Spec		Plant Record	A	J	S	W/Z		Y		
1.1.5.1.4	Root radius	Measurement		IS 808		Plant Record	A	J	S	W/Z		Y		
1.1.5.1.5	Weight Tolerance For Angle Sections	Unit Weight Test		IS 1852/ IS 808		Plant Record	A	J	S	W/Z		Y		
1.1.5.2	<b>Plates</b>													
1.1.5.2.1	Weight Tolerances	Unit Weight Test	Plant Standard of Transmission Line Tower Manufacturer	IS 1852 / IS 1730	As per relevant IS standards	Plant Record	A	J	S	W/Z		Y		
1.1.5.2.2	Thickness Tolerance	Measurement		IS 2082 IS 1730 / IS 1852		Plant Record	A	J	S	W/Z		Y		
<b>1.2</b>	<b>Zinc (To be procured from POWERGRID approved sources or Imported LME registered source)</b>											E		
1.2.1	Chemical Composition	Chemical	Every Consignment	IS 209/IS 13229	IS 209/IS 13229	Zinc Manufacturer TC	B	K	P	W		N		
			One sample for 100MT or Part thereof	IS 209/IS 13229	IS 209/IS 13229	TPL Reports	D	L	V	W		N		
			One sample of molten zinc taken from bath per quarter	IS 209/IS 13229	Min Zinc purity 98.5%	TPL Reports	D	L	V	W		N		

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							A	J	S	Z	N		
2	<b>IN-PROCESS INSPECTION</b>												
2.1	<b>Fabrication of Tower Parts</b>												
2.1.1	Cropping (Cutting)	Dimensional	1 <sup>st</sup> Piece and every 50th Piece		Length Tolerance : $\pm 2$ mm, The cut surface to be clean, reasonable square & free from distortion.	Plant Record	A	J	S	Z	N		
2.1.2	Stamping	Visual	1 <sup>st</sup> Piece and every 50th Piece		Letter size as per POWERGRID Tech. Specn. / TPL norms	Plant Record	A	J	S	Z	N		
2.1.3	Punching / Drilling	Dimensional	1 <sup>st</sup> Piece and every 50th Piece		Holes for bolts shall be drilled or punched with a jig but drilled holes shall be preferred. The punching may be adopted for thickness up to 12 mm. Tolerances regarding punch holes should be as follows:	Plant Record	A	J	S	Z	N		
2.1.4	Edge Security	Dimensional	1 <sup>st</sup> Piece and every 50th Piece	IS 802 Part II/ IS 7215/ POWERGRID approved Drwg., Shop Sketches		Plant Record	A	J	S	Z	N		
2.1.4.1	For 13.5 mm dia Hole				Sheared 20mm Min. Rolled 16mm Min.								
2.1.4.2	For 17.5 mm dia Hole				Sheared 23mm Min. Rolled 20mm Min.								
2.1.4.3	For 21.5 mm dia Hole				Sheared 28mm Min. Rolled 25mm Min.								
2.1.4.4	For 25 mm & 25.5 mm dia Hole				As per approved drawing								
2.1.5	Drilling & Punching Hole To Hole Distance		1 <sup>st</sup> Piece and every 50th Piece		Tolerance cumulative and between consecutive hole shall be within $\pm 2$ mm and $\pm 1$ mm respectively	Plant Record	A	J	S	Z	N		
2.1.6	Notching Flange Cut Corner Cut Bevel Cut		1 <sup>st</sup> Piece and every 50th Piece		+ 5mm on specified length of cut, operationally shearing up to 12 mm thick & by gas cutting for material above 12 mm thick	Plant Record	A	J	S	Z	N		


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							A	J	S	Z		N	
2.1.7	Heel Cutting	Dimensional	1 <sup>st</sup> Piece and every 50th Piece	POWERGRID Approved Dwggs./ Shop Sketches	for members > 12mm thick – gas cutting may be adopted followed by grinding/Machine cutting; Tolerance on heel cutting length: +10mm	Plant Record	A	J	S	Z		N	
2.1.8	Bending		100% Pieces	IS 802 (Part II)/ IS 7215/ POWERGRID Approved Drawing / Shop Sketches	(1) HT Sections / Plates - All Sections & all plates to be hot bent. (2) MS Section- i) Cold – Section upto 75X75X6 - Angle Upto 10° ii) Cold – Section upto 100X100X8 – Angle Upto 5° iii) Hot - Section above 75X75X6 – Angle Above 10° iv) Hot - Section above 100X100X8 – Angle Above 5°	Plant Record	A	J	S	Z		N	
2.1.9	Welding						A	J	S	Y		N	WPS and Welder's qualification shall be done in line with Welder's Qualification Guideline
2.1.9.1	(a) WPS Approval (Welding procedure specification) (b) PQR/WQR Approval (Procedure /Welder qualification record)			As per POWERGRID Technical specn/Approved Drg./POWERGRID approved Welding procedure & Welder's qualification		Plant Record	A	J	S	Y		N	
2.1.9.2	Dye-Penetration Test	Visual	Random Basis	As per POWERGRID Technical specn/Approved Drg./POWERGRID approved Welding procedure & Welder's qualification		Plant Record	A	J	U	Y		N	CIP
2.1.9.3	Dimensional & visual for welded tower parts	Dimensional	Random Basis	As per POWERGRID Technical specn/Approved Drg./POWERGRID approved Welding procedure & Welder's qualification		Plant Record	A	J	U	Y		N	CIP
2.1.10	Final Inspection of Fabricated Parts		Random Basis	All parameters from 2.1.1 to 2.1.13 above are checked and record maintained before releasing the material for galvanizing.		Plant Record	A	J	S	Z		N	

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							A	J	S	Z	N		
2.1.11	<b>Foundation Bolts</b>	Physical	1st piece & every 50th piece	IS 802/POWERGRID Technical spec./Approved drawing		Plant Record	A	J	S	Z	N		
2.1.11.1	Cutting & Shearing												
2.1.11.2	Chamfering												
2.1.11.3	Threading												
<b>2.2</b>	<b>Galvanizing</b>												
2.2.1	Degreasing	Chemical	One sample daily	IS 2629	Manufacturer's plant standard/Relevant IS	Plant Record	A	J	S	Z	N		
2.2.2	Pickling	Chemical	One sample daily	IS 2629	Manufacturer's plant standard/Relevant IS Iron contents 100 to 120 gram/litre. Max	Plant Record	A	J	S	Z	N		
2.2.3	Rinsing	Chemical	One sample daily	IS 2629	Manufacturer's plant standard/IS	Plant Record	A	J	S	Z	N		
2.2.4	Pre Fluxing	Chemical	One sample daily	IS 2629	IS 2629	Plant Record	A	J	S	Z	N		
2.2.5	Pre-heating	Measurement	One Check per day	IS 2629	IS 2629	Plant Record	A	J	S	Z	N		
2.2.6	Dipping After drying is over the material is dipped in molten zinc. Following parameters are controlled												
2.2.6.1	Zinc bath temperature Recording is done by graphical manner or sensors with digital display		Hourly Check	IS 2629	450+/-10° C	Plant Record	A	J	S	Z	N		
2.2.6.2	Immersion & Withdrawal time. Degree of immersion and withdrawal time is decided based on thickness and length of material		Hourly Check	IS 2629	IS 2629	Plant Record	A	J	S	Z	N		



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							A	J	S	Z	N	
2.2.7	Quenching in Running Water: After dipping the material is quenched in running water			IS 2629	IS 2629	Plant Record	A	J	S	Z	N	
2.2.8	Dichromating : After quenching, material is dipped in sodium dichromate solution to avoid the white rust.(Proprietary Chemicals.)		One Sample daily	IS 2629	IS 2629	Plant Record	A	J	S	Z	N	
<b>2.3</b>	<b>Galvanizing Check</b>											
2.3.1	Visual Checking	Visual	100%	IS 2629	Surface to be free from defects like bare / black spots, (except when small and suitable for patching) heavy ash & flux inclusions, lumps, pimples, runs etc	Plant Record	A	J	S	Z	N	*For marine mentioned in BPS, Coating Thickness shall be $\geq 5\text{mm}=127$ micron, $<5\text{mm}$ & plate=87 micron *For marine, $\geq 5\text{mm}=900\text{gm}/\text{m}^2$ , $<5\text{mm}$ & plate=610 $\text{gm}/\text{m}^2$
2.3.2	Thickness of Zinc coating	Measurement	8 samples/shift	IS 4759	The minimum average zinc coating for all section shall be 87 microns for thickness $\geq 5$ mm & 65 microns for thickness $< 5\text{mm}$ and for plates	Plant Record	A	J	S	Z	N	
2.3.3	Weight of Zinc Coating	Measurement	3 samples/shift	IS 4759 / IS 6745	(a) For thickness below 5mm, but not less than 2 mm and for plates- Average Mass of Coating -460 $\text{gm}/\text{m}^2$ (b) For thickness 5mm & above – Average Mass of Coating - 610 $\text{gm}/\text{m}^2$	Plant Record	A	J	S	Z	N	
2.3.4	Uniformity of Zinc coating	Measurement	3 samples/shift	IS 2633	Material to withstand 4 dips of one minute each without showing signs of copper deposits	Plant Record	A	J	S	Z	N	
2.3.5	Adhesion Tests of Zinc coating	Pivoted Hammer Test	3 samples/shift	IS 2629	No removal or lifting of coating in areas between hammer impressions	Plant Record	A	J	S	Z	N	


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