GUJRAT ENERGY TRANSMISSION CORPORATION LTD.

STANDARD APPROVAL

STANDARD MANUFACTURING QUALITY PLAN

GETCO/CE(Engg)/III/D/O-006499
Date:06.04.2021

MATERIAL DESCRIPTION : STANDARD MQP GALVANIZED STEEL STRUCTURES FOR GETCO SUPPLY

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1. RAW MATERIAL INSPECTION

S.No	Component / Operation & Description of Test	Sampling Plan with basis	Ref. Doc & Acceptance norm	Record Format	Testing Agency			Remarks
					M	C	TPIA	
1 1.1	Raw Materials Structural Steel (Angles, Flats, Plates , Channels and Bars) as per IS 2062 Pipe – IS 1161 /1239		IS 2062 E-350 For HT IS 2062 E-250 A For MS					Steel to be procured from prime producers such as SAIL,TISCO,RINL,JINDAL etc. or GETCO approved reroller.
1.1.1	Physical Properties/ Mechanical properties		IS 2062 : 2011					
(a)	Tensile strength	1 Sample/ 40 MT for each type.	Annexure-A	MTC	P	R	-	MTC review at the time of final inspection
(b)	Test For Yield Stress	- Do -	- Do -	MTC	P	R	-	- Do -
(c)	Percentage Elongation	- Do -	- Do -	MTC	P	R	-	- Do -
(d)	Bend Test	- Do -	- Do -	MTC	P	R	-	- Do -
(e)	Impact Test	- Do -	For HT Material(BR,B0 and C Grades) as per GETCO approved Structure Drawing/BOM or GETCO approval Letter.	MTC	P	R	-	Min 27J.at Room Temp.25 ±2^{0}C as per IS 2062-2011
1.1.2	CHEMICAL COMPOSITION (Product Analysis)	- Do -	Annexure-A	MTC	P	R	P*	MTC review at the time of final inspection
1.1.3	ZINC Chemical composition of Zinc Ingot	- Do -	IS 209 Zinc purity min 99.99%	TC	P	R	P*	MTC to be reviewed at the time of Final Inspection (Zinc Procured from Prime producer or prior approval from GETCO is required)
1.1.4	VISUAL CHECKS FOR SURFACE FINISH	IS 2500,Level II, AQL-1.5	Material shall be reasonably free from surface flaws; laminations; rough/jagged and imperfect edges and all other harmful defects	IR	P	R	-	MTC review at the time of final inspection
1.1.5	DIMENSIONAL CHECKS	IS 2500 Level II, AQL-1.5	IS 1852, IS 808	IR	P	R	-	MTC review at the time of final inspection

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S.No	Component / Operation & Description of Test	Sampling Plan with basis	Ref. Doc & Acceptance norm	Record Format	Testing Agency			Remarks
					M	C	TPIA	
1.1.6	TOLERANCES FOR LEG LENGTH OF ANGLES EQUAL / UN EQUAL	IS 2500 Level II, AQL-1.5.	For ≤45mm = ± 1.5mm For 45 to 100 = ± 2.0mm For >100 = ± 2.0% of leg length **For unequal leg**: +2,-1.5mmfor longer leg length for shorter leg length as per 1.1.7	IR	P	R	-	MTC review at the time of final inspection
1.1.7	OUT OF SQUARE NESS	IS 2500 Level II, AQL-1.5.	Perpendicular to each other ± 1°	IR	P	R	-	
1.1.8	CAMBER or SWEEP	IS 2500 Level II, AQL-1.5.	For <100= ±0.3 % of length For ≥100= ±0.2 % of length Max.	IR	P	R	-	
1.1.9	WEIGHT TOLERANCE FOR ANGLE SECTIONS & FLAT	1 Sample/ 40 MT for each type.	For < 3mm thick ±5 % For > 3mm thick +5 % / -3%	IR	P	R	-	
1.2.0	WEIGHT TOLERANCE FOR PLATES	1 Sample/ 40 MT for each type.	+ 5/-2.5 %	IR	P	R	-	
1.2.1	THICKNESS TOLERANCE FOR PLATES	IS 2500 Level II, AQL-1.5.	< 8 mm thick : + 12.5 %, - 5 % 8 mm - 12 mm : + 7.5 %, - 5 % over 12 mm : ± 5 %	IR	P	R	-	
1.2.2	ROOT RADIOUS	IS 2500 Level II, AQL-1.5.	IS 808 (As per Table 5.1)	IR	P	R	-	
1.2.3	WIDTH TOLERANCE FOR FLAT THICKNESS TOLERANCE FOR FLAT	IS 2500 Level II, AQL-1.5.	IS 1730/1852 <50mm ±1.0mm, >50<75mm ±1.5mm, >75<100mm ±2.0mm, >100< ±2.0% ,Max 6.0mm Thickness Upto & including 12mm ± 5mm,Over 12mm ± 4% Max.1.5mm.	IR	P	R	-	

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S.No	Component / Operation & Description of Test	Sampling Plan with basis	Ref. Doc & Acceptance norm	Record Format	Testing Agency			Remark
					M	C	TPIA	
1.2.4	**ROUND BARS** a. Diameter(d) Tolerance	IS 2500 Level II, AQL-1.5.	IS 1852 d<25mm ±0.5mm, 25<d<35mm ±0.6mm, 35<d<50mm ±0.8mm, 50<d<80mm ±1.0mm, 80<d<100mm ±1.3mm , 100<d< ±1.6 % of Diameter or side width.	IR	P	R	-	MTC review at the time of final inspection
	b. Ovality & out-of-Square	- Do -	IS 1852 The permissible ovality for round bars measured as the difference between the maximum and minimum diameters and the out-of-square of square bars measured as the distance between parallel faces across any cross section shall be 75% of total tolerance (plus & minus) specified on the size.	IR	P	R	-	
	c. Weight Tolerance	- Do -	IS 1852 Up to and including 10mm ±7%, above 10 to 16mm ±5% & above 16mm ±3%	IR	P	R	-	

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2. IN PROCESS INSPECTION

S.No	Component / Operation & Description of Test	Sampling Plan with basis	Ref. Doc & Acceptance norm	Record Format	Testing Agency			Remark
					M	C	TPIA	
	INPROCESS INSPECTION FABRICATION OF TOWER PARTS		IS 802 Part II/ IS 7215/ approved Drwg.,	Routine Sheet	P	R	-	
(a)	**STRAIGHTENING**	100%		Routine Sheet	P	R	-	
(b)	**CROPPING (CUTTING TO LENGTH)**	1st Piece and every 40th Piece	Length Tolerance ± 2 mm The cut surface to be clean, reasonable square & free from distortion	Routine Sheet	P	R	-	
(c)	**SECTION SIZE**	1 piece at random for each item	IS 802 Part II/ IS 7215/ approved Drwg.,	Routine Sheet	P	R	-	

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S.No	Component / Operation & Description of Test	Sampling Plan with basis	Ref. Doc & Acceptance norm	Record Format	Testing Agency			Remark
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(d)	**STAMPING / MARKING**	1st Piece and every 40th Piece	9X16 MM & 0.45 MM Depth (Easily to be seen)	Routine Sheet	P	R	-	
(e)	**PUNCHING / DRILLING**	- Do -	Punching to be done for thickness up to 12 mm and Drilling to be done for thickness more than 12 mm. Holes near bends to be punched/ drilled after bending. Hole should be perpendicular to surface & difference in dia on both sides of flange should not be more than 0.8mm, Hole Ovality not acceptable.	Routine Sheet	P	R	-	
(f)	**EDGE SECURITY**	1st Piece and every 40th Piece	IS 802 PART II/ IS 7215 / approved drwg. **For 13.5 mm Dia Hole** Sheared Edge 20 MM & Rolled Edge 16 MM **For 17.5 mm Dia Hole** Sheared Edge 23 MM & Rolled Edge 20 MM **For 21.5 mm Dia Hole** Sheared Edge 28 MM & Rolled Edge 25 MM **For 25.0 mm Dia Hole** Sheared Edge 38 MM & Rolled Edge 33 MM /As per Approved Drawing.	Routine Sheet	P	R	-	
(g)	**DRILLING & PUNCHING** Hole to Hole Distance/Spacing/Gauge distance	1st Piece and every 40th Piece	Tolerance cumulative and between consecutive Hole shall be within ±2 mm & ±1 mm respectively & ± 0.5 mm Gauge distance.	Routine Sheet	P	R	-	
(h)	**NOTCHING,FLANGE,CORNER,BEVEL CUT**	1st Piece and every 40th Piece	+ 5.0 mm on specified length of cut operation by shearing upto 12 mm thick and by Gas Cutting for material above 12mm.	Routine Sheet	P	R	-	

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					M	C	TPIA	
(i)	**HEEL CUTTING**	- Do -	For Member > 12 mm thick. Gas cutting to be adopted followed by grinding/Machine cutting. Tolerance on heel cutting length + 10 MM.	Routine Sheet	P	R	-	
(j)	**BENDING**	100%	**(i)Angle Sections :** Upto 75x75x6 (Upto 10deg)- Cold Bend Upto 100x100x8 (Upto 5deg)- Cold Bend Above 75x75x6 (above 10deg)- Hot Bend Above 100x100x8 (above 5deg)- Hot Bend All HT sections and plates shall be Hot bend. **(ii) MS Plates** Upto 12mm thick (upto 15 degree)-Cold Bend Others (Any degree) - Hot Bend	Routine Sheet	P	R	-	
(k)	**Welding /Fitting/** a)Marking,Cutting,Edge Preparation b)Fit Up, Dimensional Control	100% 100%	IS 9595 a) As per Drawing/Specification of GETCO b) As per Drawing/ Specification of GETCO	Routine Sheet	P	R	-	

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					M	C	TPIA	
I	**PROTO ASSEMBLY** **Visual & Dimensional Inspection**	One Structure of each Tower Type.	As per GETCO approved Drawings & BOM. All parameters from (a) to (k) above are checked and record maintained shall be verified by GETCO Inspector before releasing the materials for galvanizing.	Proto Inspection Report	P	W	-	**Proto Corrected BOM must be verified and signed by GETCO Inspector & Manufacturer. Deviation in tower member must be clearly indicated in BOM & MOM with tech'cal justification and same shall be thoroughly inspected by GETCO Inspector**

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3. GALVANIZING

S.No	Component / Operation & Description of Test	Sampling Plan with basis	Ref. Doc & Acceptance norm	Record Format	Testing Agency			Remarks
					M	C	TPIA	
(a)	**DEGREASING** 1. Caustic solution / alkali based degreaser to be followed by Rinsing Water or 2. Acid based degreaser	One sample daily One sample daily	IS 2629 with Latest amendments. 10-15Kg of NaoH/100 Litres of H_2O. Temp of Solution : 85-90 °C As per Manufacturers recommendation.	Process Report/ Register	P	R	-	
(b)	**PICKLING** 1. Acid content 2. Iron Content	One sample daily One sample daily	HCL : @ Room Temp. Conc : 100-150g/l. H2SO4 : @ 60-80 °C. Conc : 100-150g/l. (Inhibitor to be used with Both types of Acid.) When iron content reaches 100-120g/l, the solution shall be discarded.	-Do-	P	R	-	
(c)	**RINSING** Only in absence of Auto Neutralization of Pre Flux solution	One sample daily	IS: 2629 with latest amendments (ph = 4 to 7)	-Do-	P	R	-	
(d)	**PREFLUXING** In Zinc chloride and Ammonium Chloride solution patent fluxing reagent	One sample daily	Iron Content : 50 Gms/Ltr Max. Sp. Gravity : 1.16 to 1.24 pH : 3 to 6	-Do-	P	R	-	

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S.No	Component / Operation & Description of Test	Sampling Plan with basis	Ref. Doc & Acceptance norm	Record Format	Testing Agency			Remarks
					M	C	TPIA	
(e)	**PREHEATING** On hot plate / dry air oven		70°C - 120 °C		P	R	-	
3.1	**DIPPING**						-	
(a)	Zinc Bath temperature recording is done by digital thermometer.	Hourly Check	440 °C to 460 °C	-Do-	P	R		Lab Report to be reviewed at the time of Final Inspection
(b)	Chemical composition of Zinc Bath	1 sample / Month	Mass of zinc in bath min 98.5%	Lab Report	R	R	P*	
(c)	**Immersion & Withdrawal time.**		Articles to be immersed till reaction takes place which is indicated by stoppage of bubbling, withdrawal to be controlled so that Zinc drains freely	-Do-	P	R	-	
(d)	**QUENCHING & RUNNING WATER**		After dipping the material is quenched in water temp < 60^0C		P	R	-	
(e)	**DICHROMATING**	One sample daily	Strength of Solution to be maintained 1% & temp <65°	-Do-	P	R	-	

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3.2	**GALVANIZING CHECKING**		IS 2629, 4759, 6745, 2633					
(a)	VISUAL CHECKING	100%	Free from harmful galvanizing defects	IR	P	R	-	
(b)	Thickness of Zinc Coating (a) Below 5mm thick (b) 5mm thick & above	8 samples / shift	IS 2629 (a) 65 micron Avg Min. (b) 87 micron Avg Min. (C) Refer Note, Page 11 of 13 of QAP	IR	P	R	-	
(c)	Mass of Zinc coating	3 samples / shift	(a) 460 g/m². (b) 610 g/m². (C) Refer Note Page 11 of 13 of QAP	IR	P	R	-	
(d)	Uniformity of Zinc coating	3 samples / shift	**IS 2633** (4 dips of 1 minutes without showing sign of copper deposits)	IR	P	R	-	
(e)	Adhesion Test of Zinc coating(Pivot Hammer test/knife test)	1 samples / shift	**IS 2629** (No peel out of Zinc coating in areas between hammer impressions)	IR	P	R	-	

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4. FINAL INSPECTION AND TESTING

S.No	Component / Operation & Description of Test	Sampling Plan with basis	Ref. Doc & Acceptance norm	Record Format	Testing Agency			Remarks
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(a)	**VISUAL & DIMENSIONAL INSPECTION** Refer CL.1.1.5-1.2.4 Page 01-02 of QAP	Sample as Per Table-II Page 13 of 13 of QAP	As per GETCO approved drawing & BOM	IR	P	W	-	Inspection Reports
(b)	**PHYSICAL / MECHANICAL PROPERTIES** (i) UTS Tests (ii) Yield Stress Test (iii) % Elongation Test (iv) Bend Test	1 Sample/ 40 MT for each type.	Refer CL.1.1.1 Page 01 of 13 of QAP for Physical/Mechanical Properties	Test Report	P	W	-	Test perform by Manufacturer in presence of GETCO representative
(c)	**GALVANIZING TESTS** (i) Thickness of Zinc Coating (ii) Mass of Zinc coating (iii) Uniformity of Zinc Coating (iv) Adhesion of Zinc coating	1 Sample/ 40 MT for each type.	Refer CL.3.2 Page 08 of 12 of QAP for Galvanizing Checking.	Test Report	P	W	-	Test perform by Manufacturer in presence of GETCO representative
(d)	**CHEMICAL TEST**	1 Sample/ 40 MT for each type.	IS 2062 : 2011 As per Annexure A & Table 3 Page 11 of 12 of QAP	Test Report	P	W	-	Test perform by Manufacturer in presence of GETCO representative
(e)	**TOWER ERECTION MARKING**	Sample as Per Table-II, Page 13 of 13 of QAP	Refer Project Specific GETCO approval Letter for Tower Erection Marking.	Visual	P	W	-	To be verified by GETCO Inspector during Inspection & shall be mentioned in MOM.
(f)	**Packing/Bundling** **Tower Wise/Section wise**	100 %	As per GETCO specification	BP, Packing List	P	W	-	Bundling Plan, Packing List shall be provide by Manufacturer.

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Code:	M= Manufacturer, C= GETCO/ any Third Party Inspection Agency deputed by GETCO., TPIA = Third Party Inspection Agency. IR= Inspection Report., MTC= Mill Test Certificate., P = Perform., P* = Perform by TPIA if non availability of testing facility at Works , R= Review., V= Verify., W=Witness, BP = Bundling Plan

Note:

1. Under marine environment, the fabricated structures shall have a minimum overall Zinc coating of 900 gm/sq.m of surface are except for plates and sections below 5mm which shall have a minimum overall Zinc coating 610gm/sq.m of surface area. The average Zinc coating for all sections and plates 5mm and above shall be maintained minimum 127 microns and that for plates and sections below 5mm shall be maintained minimum 87 microns as per GETCO specification.
2. Zinc coating for 11kv Outdoor structures shall be carried out as per Note 1, irrespective of location.
3. Zinc Coating shall be in accordance with GETCO Tender/EPC Project and or GETCO approval Letter.
4. The bolt nuts shall be procured from the GETCO approved vendor.
5. GETCO reserves right for inspection of any material during manufacturing process at any stage and also reserves right to carry out any other test(s) of responsible nature at supplier's works or site or in any other place in addition to the type & routine tests to satisfy that the material confirms with the specification of GETCO at our own cost.
6. However, you have to get separate vendor approval for re-rollers & bought out items from GETCO.

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Signature of the Manufacture: **Name:** **Designation:** ***Date :***	**Signature of the Contractor:** **Name:** **Designation:** ***(Only Furnish If Applicable i.e. GETCO PROJECT/DEPOSIT WORK)***	**LOA-AT No/Estimate No:**
Authorised common rubber **Stamp / seal of the Manufacturer:**	**Authorised common rubber** **Stamp / seal of the Contractor:**	**Tender/Project Specific Stamp :**

GUJRAT ENERGY TRANSMISSION CORPORATION LTD.

STANDARD APPROVAL

STANDARD MANUFACTURING QUALITY PLAN

GETCO/CE(Engg)/III/D/O-006499
Date:06.04.2021

MATERIAL DESCRIPTION : STANDARD MQP GALVANIZED STEEL STRUCTURES FOR GETCO SUPPLY

QAP No.	GETCO STANDARD APPROVAL	Rev. No	Date	Page No
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Annexure - A

IS 2062 : 2011		Physical / Mechanical Properties			Bend Test		Chemical Properties					
Grade	Quality	Minimum Values			Min		Maximum Values in %					
		Yield Stress N/mm² (Min.)	UTS N/mm² (Min.)	% of Elongation (Min.)	≤25	>25	C	Mn	S	P	Si	CE
E 250	A	T<20 mm : 250	410	23%	2t	3t	0.23	1.50	0.045	0.045	0.40	0.42
	BR / BO	T >20-40 mm : 240					0.22	1.50	0.045	0.045	0.40	0.41
	C	T >40 : 230					0.20	1.50	0.040	0.040	0.40	0.39
E 350	A	T<20 mm : 350	490	22%	2t	---	0.20	1.55	0.045	0.045	0.45	0.47
	BR / BO	T >20-40 mm : 330										
	C	T >40 : 320					0.20	1.55	0.040	0.040	0.45	0.45
	IS 2062 : 2011 TABLE -3 Permissible Variation for product Analysis						C< 0.20 = 0.02 C> 0.20 = 0.03	0.05	0.005	0.005	0.03	--

Note for Bend Test: For bend test, the test piece at room temperature shall withstand bending through 180⁰ .to an internal diameter not greater than that given in Table 2 without cracking as per IS 2062-2011 with latest amendment.

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Sampling Plan

TABLE-1
Sampling plan for Visual & Dimensional Check of Raw Materials As Per IS-2500, Level II, AQL 1.5

S.No.	Lot Size	Sample Size	Acceptance No.	Rejection No
1	2 to 8	100%	0	0
2	9 to 15	8	0	1
3	16 to 25	8	0	1
4	26 to 50	8	0	1
5	51 to 90	8	0	1
6	91 to 150	20	1	2
7	151 to 280	32	1	2
8	281 to 500	50	2	3
9	501 to 1200	80	3	4
10	1201 to 3200	125	5	6
11	3201 to 10,000	200	7	8
12	10,001 to 35,000	315	10	11
13	35,001 to 1,50,000	500	14	15
14	1,50,001 & Above	800	21	22

TABLE-II
Sampling plan for Visual & Dimensional Characteristics of Structural Steel for Final Inspection (Dimension Check)
(Refer Para 4.4 Final Inspection & Testing)
As Per IS-2500, Level II, AQL 1.5
NUMBER OF PIECES

S.No.	Lot Size	Sample Size	Acceptance No.	Rejection No
1	2 to 8	100%	0	0
2	9 to 15	8	0	0
3	16 to 25	8	0	0
4	26 to 50	8	0	0
5	51 to 90	8	0	0
6	91 to 150	20	0	1
7	151 to 280	32	0	1
8	281 to 500	50	0	2
9	501 to 1200	80	0	3
10	1201 to 3200	125	0	5
11	3201 to 10,000	200	0	7
12	10,001 to 35,000	315	0	10
13	35,001 to 1,50,000	500	0	14
14	1,50,001 & Above	800	0	21

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