




BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

		Vendor's Code	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
			Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision


Notes and codes

<p>Code 1 Indicates place where testing is planned to be performed i.e. Inspection location</p> <p>A At Equipment Manufacturer's works B At Component Manufacturer's works C At Authorised Distributor's place D At Independent Lab E At Turn Key Contractor's location F Not specified</p>	<p>Code 2 Indicates who has to perform the tests i.e. Testing Agency</p> <p>J The Equipment Manufacturer K The Component Manufacturer L The Third Party M The Turnkey Contractor</p>
<p>Code 3 Indicates who shall witness the tests i.e. Witnessing Agency</p> <p>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 BSPTCL V Third Party itself</p>	<p>Code 4 Review of Test Reports/Certificates</p> <p>W By Equipment manufacturer X By Contractor during product/process inspection Y By BSPTCL during product/process inspection Z By Contractor and/or BSPTCL during product/process inspection</p>
<p>Code 5 Whether specific approval of sub-vendor</p> <p>E Envisaged N Not Envisaged</p>	<p>Code 6 Whether test records required to be submitted after final inspection for issuance of Dispatch Instructions/</p> <p>Y Yes N No</p>


	BIHAR STATE POWER TRANSMISSION COMPANY LIMITED				
	MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)				
		Vendor's Code	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
			Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision
Notes and codes					

Notes:

1. The MQP should be read in conjunction with BSPTCL specification and shall deem to include additional tests if any required as per the contract.
2. BSPTCL specification shall include provisions of letter of Intent/Purchase Order/Work Order , BSPTCL approved drawings /technical data sheet / BOM / test schedule / test procedure applicable to the specific contract.
3. In case of any contradiction between the manufacturer's plant standards , this MQP and BSPTCL specification following precedence shall be followed
 - a) BSPTCL specification .
 - b) This Manufacturing Quality plan .
 - c) Manufacturer's plant standards .
4. It is the responsibility of the manufacturer to ensure that this document is readily available at their works, as well as the works of their sub vendor in order to avoid any delay at the time of inspection
5. The manufacturer shall ensure that their as well as their sub vendors control, metering & testing instruments are duly calibrated and should have calibration certificates traceable to Indian/International standards. Calibration records should be available during inspection by BSPTCL. Key testing instruments will be calibrated by NABL accredited laboratories or an agency having full membership & MRA of ILAC/APLAC
6. In case of any tests being carried out at third party lab , such lab / facility should by NABL or an agency having full membership & MRA of ILAC/APLAC accredited / accepted by BSPTCL.
7. 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 BSPTCL.
8. Manufacturer shall show the approval of BSPTCL engineering for all contract specific type tests, including specific type tests if any as per the BSPTCL specification at the time of final inspection.
9. All packing cases should be marked with BSPTCL Order details, name of project, item description and Dispatch Instructions/ Clearance number (by which material has been cleared for dispatch).

	BIHAR STATE POWER TRANSMISSION COMPANY LIMITED				
	MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)				
		Vendor's Code	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
			Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision
Notes and codes					

10. One copy of test report , Dispatch Instructions/ Clearance shall also be sent along with consignment .
11. Inspection of spare items ordered by BSPTCL shall also be governed by the provisions of this MQP . Items if not governed under MQP shall be offered for inspection as per BSPTCL specifications / Relevant-Indian / International Standards.
12. The manufacturer shall align their quality system and that of their sub-vendors to the requirements of latest ISO 9000 quality standards in a time bound manner
- 13 In case of change of name of sub-vendor Transformer Manufacturer shall submit request to update the same along with supporting documents
- 14 Whenever Indian / International standard are referred their last amendment shall be included , The same shall be applicable in case of Transformer Manufacturer specification also so long as these changes are made with the approval of competent authority of Transformer Manufacturer.
- 15 Raw material / bought out items (envisaged) shall be procured from BSPTCL approved source only.
- 16 All out sourced services shall be from approved sources only.
- 17 Surveillance checks shall be carried out by BSPTCL sources as and when deemed necessary no inspection call to be given for surveillance check.
- 18 The manufacturer to get clearance / approval from BSPTCL Engg for the type test on first Transformer of each rating against each contract including Bushing , Buchholz relay , OLTC , Cooler Control Cabinet , PRD , MOLG , Air cell , OTI & WTI , OIL PUMP , Cooling Fan Motor assembly & Terminal connector as applicable in TS of contract in question.
19. BSPTCL may review the effective implementation of the processes during the product-inspection / process-inspection.
In case any violation in process or process parameters are observed, the reason along with corrective & preventive measures shall be conveyed. to BSPTCL within 2 weeks
20. This MQP is Standard MQP for Power Transformer upto 400 kV to be manufactured at the works of Transformer Manufacturer.
- 21.. No inspection calls should be raised unless and until GTP/Drawings/Design Review/Type test reports approved by BSPTCL Engineering.

	BIHAR STATE POWER TRANSMISSION COMPANY LIMITED				
	MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)				
		Vendor's Code	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
			Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision
Notes and codes					

22. Third party Lab where testing/calibration is to be carried out should be accredited by NABL or an agency having full membership & MRA of ILAC/APLAC .

23 . Transformer Manufacturer shall ensure that all test mentioned in Technical Specification of subject contract in question need to be carried out strictly, without Fail.

EM : Equipment Manufacturer, CM: Component Manufacturer, TC: Test Certificate, TPL: Third Party Lab



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.1	PAPER COVERED RECTANGULAR COPPER CONDUCTOR NORMAL , BUNCHED& PROOF STRESS										E		
1.1.1	Visual & Dimensional check, Thickness & width of bare conductor,corner radius, visual check for surface finish, number of layers of paper covering, arrangement of layers, increase in dimensions due to paper covering & covered thickness.	Measurement & Visual.	IS 2500 Pt1AQL 4% Inspection level 1 Lot Sample Size Size 2 to 90 3 91 to 280 13	EM Specification & Plant standard No:QAMS/AN-001/ IEC 60317 Part 27 / IS 13730 (Part 27)	Tol on dim of bare conductor Width / Thickness Tol. (mm) (mm) upto 3.15 0.03 > 3.15 to 6.30 0.05 > 6.30 to 12.50 0.07 > 12.50 to 16 0.10	CM TC	B	K	Q/U	W /Z		Y	
					Minimum no of paper layers & Tolerance on paper covering Paper Covering Tol. (mm) % 0.25 to 0.5 -- 10+ 0 > 0.5 to 1.3 -- 7.5 +0 > 1.3 -- 5 + 0								DO
					Tol. on corner radius +/- 25%								DO
1..1.2	Checks for	Testing	One sample per type per lot	EM Specification & Plant standard No:QAMS/AN-001/ IEC 60317 Part 27 / IS 13730 (Part 27)	EM Specification & Plant standard No:QAMS/AN-001/ IEC 60317 Part 27 / IS 13730 (Part 27)	CM TC	B	K	Q/U	W /Z		Y	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.1.2.1	Resistivity at 20° C	Electrical	DO	DO	0.017241 ohm mm ² / mtr max. for annealed conductor & 0.01777 ohm mm ² / mtr max. for work hardened (Proof stress) conductor	CM TC	A/B	J/K	Q/U	W /Z		Y	DO
1.1.2.2	Elongation (for normal conductor)	Mechanical	DO	DO	30% min for thick.Upto 2.5mm, 32% min.for thick.2.5 to 5.6mm	CM TC	B	K	Q/U	W /Z		Y	DO
1.1.2.3	Proof stress (for proof stress conductor) if applicable	Mechanical	DO	DO	As per Design review documents	CM TC	B	K	Q/U	W /Z		Y	DO
1.1.2.4	Insulation test for bunched conductor	Electrical	DO	DO	1 Amp max. charging current at 250V for 1 minute	CM TC	B	K	Q/U	W /Z		Y	DO
1.1A	EPOXY ENAMEL COATED BUNCHED PAPER INSULATED COPPER CONDUCTOR(EEBPICC)/GLUED ENAMEL COATED BUNCHED PICC(GLUED EBPICC) NORMAL & PROOF STRESS (If Applicable)										E		
	Incase of Glued EBIPCC Check for proper storage of epoxy bonded bunched P ICC in refrigerated container.(To be kept in aircondition container immediately after receipt.Transportation from Mfr. Works shall be in air conditioned container. temp, of container to be monitored periodically)	Visual	100%	EM Specification & Plant standard / IEC 60317 Part 27 / IS 13730 (Part 27)	Coils to be made before expiry of shelf life. EEBPICC and Glued EBPICC shall not be used after expiry of shelf life & curing process should be over before expiry of shelf life of EEBPICC/Glued EBPICC.	EM Record	A	J	S	W/Z			



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.1A.1	<u>VISUAL AND DIMENSIONAL CHECKS.</u> Thickness, width of bare conductor, corner radius, finish, number of layers of paper covering, arrangement of layers, increase in dimension due to paper covering, enamel covered thickness, thickness of epoxy bonded.	Measurement & Visual.	IS 2500 Pt1 AQL 4% Inspection level 1 Lot Sample Size Size 2 to 90 3 91 to 280 13	EM Specification & Plant standard / IEC 60317 Part 27 / IS 13730 (Part 27)	Tol. on dim of bare conductor Width / Thickness Tol.(mm) (mm) upto 3.15 0.03 > 3.15 to 6.30 0.05 > 6.30 to 12.50 0.07 > 12.50 to 16 0.10	CM TC	B	K	U/Q	W / Z		Y	
					Minimum no of paper` layers & Tolerance on paper covering Paper Covering Tol (mm) % 0.25 to 0.5 -- 10+ 0 > 0.5 to 1.3 -- 7.5 +0 > 1.3 -- 5 + 0								
					Tolerance on corner radius +/- 25%								DO
1.1A.2	<u>CHECKS FOR:</u>		IS 2500 Pt 1 AQL = 4% Inspection level 1 Lot Sample Size Size 2 to 50 1 51 to 280 3 [Mfr. Shall conduct insulation test on 100% i.e. on all drums]	EM Specification & Plant standard No: QA/MS/AN-001/ IEC 60317 Part 27 / IS 13730 Part 27	EM Specification & Plant standard No:QA/MS/AN-001/ IEC 60317Part 27 / IS 13730 Part 27	CM TC	B	K	U/Q	W / Z		Y	DO
1.1A.3	Resistivity at 20° C	Electrical		DO	0.017241 ohm mm ² / mtr max. for annealed conductor & 0.017643 ohm mm ² / mtr max. for work hardened (Proof stress) conductor	CM TC	B	K	U/Q	W / Z		Y	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.1A.4	Elongation (for annealed conductor)	Mechanical		DO	30% min for Thk. Up to 2.5mm, 32% min. for Thk. 2.5 to 5.6mm	CM TC	B	K	U/Q	W / Z		Y	DO
1.1A.5	Proof stress (for proof stress conductor)	Mechanical		DO	As per Design review documents	CM TC	B	K	U/Q	W / Z		Y	DO
1.1A.6	Insulation test for bunched conductor at 250 V for 1 min.	Electrical		DO	1 Amp max. charging current at 250V for 1 minute	CM TC	B	K	U/Q	W / Z		Y	DO
1.1A.7	Check for Flexibility, adherence of enamel covering, breakdown voltage tests on enamelled conductor.	Testing		DO	EM Specification & Plant standard No:QAMS/AN-001/ IEC 60317 Part 27 / IS 13730 (Part 27)	CM TC	B	K	U/Q	W / Z		Y	DO
1.2	PAPER COVERED CONTINUOUSLY TRANPOSED COPPER CONDUCTOR (CTC) NORMAL, & PROOF STRESS & EPOXY BONDED CTC											E	
1.2.1	Visual & Dimensional check , Thickness & width of bare and enamelled conductor ,visual check for no. of conductors.	Measurement & Visual.	One sample per size per lot	EM Specification & Plant standard No:QAMS/AN-006/ IEC 60317 Part 27 / IS 13730 (Part 27) / IEC 60851	Tol. on dim of bare conductor Width / Thickness Tol. (mm) (mm) upto 3.15 0.03 > 3.15 to 6.30 0.05 > 6.30 to 12.50 0.07 > 12.50 to 16 0.10	CM TC	B	K	U/Q	W / Z		Y	
1.2.2	Increase in dimension due to enamel and due to paper covering , Verification of Axial width , radial depth & arrangement of paper covering.	Measurement & Visual.	One sample per size per lot	...DO...	...DO...	CM TC	B	K	U/Q	W / Z		Y	
1.2.3	Checks for	Testing		EM Specification & Plant standard / IEC 60317 Part 27 / IS 13730 (Part 27) / IEC 60851	EM Specification & Plant standard / IEC 60317 Part 27 / IS 13730 (Part 27) / IEC 60851	CM TC	B	K	U/Q	W / Z		Y	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.2.4	Resistance at 20° C	Electrical	One sample per size per lot	...DO...	0.017241 ohm mm ² / mtr (max.) for annealed conductor & 0.01777 ohm mm ² / mtr (max.) for work hardened (Proof stress) conductor	CM TC	B	K	U/Q	W / Z		Y	DO
1.2.4	Elongation (for normal conductor)	Mechanical	One sample per size per lot	...DO...	30% min for Thk. Up to 2.5mm, 32% min. for Thk. 2.5 to 5.6mm	CM TC	B	K	U/Q	W / Z		Y	DO
1.2.5	Proof stress (for proof stress conductor)	Mechanical	One sample per size per lot	...DO...	As per Design review documents	CM TC	B	K	U/Q	W / Z		Y	DO
1.2.6	Check for Flexibility & adherence of enamel covering & breakdown voltage test on enamelled conductor.	Mechanical	One sample per size per lot	...DO...	Should pass as per EM Specification & Plant standard	CM TC	B	K	U/Q	W / Z		Y	DO
1.2.7	Insulation test on finished cable between enamelled strips & between two stacks in case of bunched CTC	Electrical	Mfr shall conduct test on 100 % mother reel with proper co relation	...DO...	At 500V DC for 1 Minute	CM TC	B	K	U/Q	W / Z		Y	DO
1.3	KRAFT INSULATING PAPER (USED FOR COVERING PICC & CTC)											E	Record review for first unit of each contract & rest on on surveillance basis.
1.3.1	Visual check & Measurement of thickness	Measurement & Visual.	One sample per size per lot	EM Specification & Plant standard / IEC 60554/-3-1 / IS 9335 part 3 sec 5	IEC 60554-3-1	CM TC	B	K	P	W		N	
1.3.2	Checks for -												
1.3.3	Substance (Grammage)	Physical	DO	DO	IEC 60554-3-1	CM TC	B	K	P	W		N	DO
1.3.4	Density	Physical	DO	DO	IEC 60554-3-1	CM TC	B	K	P	W		N	DO
1.3.5	Moisture content	Physical	DO	DO	IEC 60554-3-1	CM TC	B	K	P	W		N	DO
1.3.6	Water absorption	Physical	DO	DO	IEC 60554-3-1	CM TC	B	K	P	W		N	DO
1.3.7	Air Permeability	Physical	DO	DO	IEC 60554-3-1	CM TC	B	K	P	W		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.4.2.2	Specific core loss test at 1.7T & 50Hz	Electrical	DO	DO	As per approved GTP / specified grade	TPLTC	D	L	U/V	W / Z		Y	DO
1.4.2.3	Stacking factor	Mechanical	DO	DO	95.5% min.	TPLTC	D	L	U/V	W / Z		Y	DO
1.4.2.4	Surface insulation resistivity	Electrical	DO	DO	Av. Value 10 ohm cm ² min	TPLTC	D	L	U/V	W / Z		Y	DO
1.4.2.5	Magnetic Polarisation at field strength of 800 AT/m & 50 Hz	Electrical	DO	DO	For regular grades 1.78 T (min.), For high permeability & domain refined grades 1.85 T (min.)	TPLTC	D	L	U/V	W / Z		Y	DO
1.4.2.6	Ageing test	Electrical	DO	DO	4% max increase in specific total loss	TPLTC	D	L	U/V	W / Z		Y	DO
1.4.2.7	Ductility	Mechanical	DO	DO	Completion of one 160° bend without fracture	DO	A/D	L/J	U/V/S	W / Z		Y	DO
1.4.2.8	Check for thickness & burr level for cut lamination	Measurement Visual	DO	DO	Plant standard No.MS/AN/08/REV0.	DO	A/D	L/J	U/V/S	W / Z		Y	DO
1.4.2.9	Check for bow ,edge camber & waviness	Measurement Visual	DO	DO	Plant standard No.MS/AN/08/REV0.	DO	A/D	L/J	U/V/S	W / Z		Y	DO
1.5	PRECOMPRESSED PRESSBOARD (PCB)			Transformer Manufacturer to send one sample/lot randomly for the received material in every six month selected by BSPTCL representative for testing in Third Party Lab *								E	Record review for first unit of each contract & rest on on surveillance basis.
1.5.1	Visual & dimensional check for thickness	Measurement & Visual.	One sample of each size per lot	EM Specification & Plant standard / IEC 60641 / BSPTCL specn.	No surface defects & dimensions within +/- 7.5 % tolerance (upto 1.6 mm) & +/- 5% tolerance (over 1.6 mm) .	CM TC	A/B	J/K	S/P	W		N	DO
1.5.2	Checks for		One sample of each size per lot	EM Specification & Plant standard / IEC 60641 / BSPTCL specn.	EM Specification & Plant standard No. / IEC 60641 / BSPTCL specn.	CM TC	B	K	P	W / Z		N	DO
1.5.2.1	Density	Physical	DO		DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.2	Oil absorption	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.3	Moisture content	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.4	Shrinkage in air	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.5	Tensile strength	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.6	Elongation	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.7	Compressibility in air	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.8	Electric strength	Electrical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.5.2.9	Ash content	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.10	pH value	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5.2.11	Conductivity of aqueous extract	Chemical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A	Moulded Components		Moulded components shall be procured from BSPTCL approved source									E	Record review for first unit of each contract & rest on on surveillance basis.
1.5 A.1	Visual check	Visual	One sample per lot	As per IEC- 60641-3-1 / EM specification	No surface defects	CM TC	B	K	P	W / Z		N	DO
1.5 A.2	Thickness measurement	Measurement	DO	DO	Within tolerance	CM TC	A/B	J/K	S/P	W / Z		N	DO
1.5 A.3	Apperandr density	Physical	DO	DO	As per IEC- 60641-3-1 / EM specification drg.	CM TC	B	K	P	W / Z		N	DO
1.5 A.4	Shrinkage MD	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.5	Shrinkage CMD	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.6	Shrinkage thickness	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.7	Ply Bond resistance	Visual	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.8	Moisture content	chemical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.9	Ash content	chemical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.10	Conductivity of aqueous extract	chemical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.11	pH of aqueous extract	chemical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.12	Oil absorption	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.13	Electric strength in oil (BDV)	Electrical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.5 A.14	Visual and dimention checks of final finished product	visual/measurement	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.6	UNIMPREGNATED DENSIFIED LAMINATED WOOD		Transformer Manufacturer to send one sample/lot randomly for the received material in every six month selected by BSPTCL representative for testing in Third Party Lab									E	



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.6.1	Visual & Dimensional check thickness, width & length	Measurement & Visual.	One sample of each size per lot	EM Specification & Plant standard / IS 3513 part 1/ IEC61061/ 60243/DIN 7707/ BSPTCL specn.	No surface defects & dimensions within tolerance.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.6.2	Checks for-		One sample of each size per lot	EM Specification & Plant standard / IS 3513 part 1/ IEC61061/ 60243/DIN 7707/ BSPTCL specn.	EM Specification & Plant standard / IS 3513 part 1/ IEC61061/ 60243/DIN 7707/ BSPTCL specn.								
1.6.2.1	Density	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.6.2.2	Moisture content	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.6.2.3	Oil absorption	Physical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.6.2.4	Electric Strength (Proof) in oil at 90 Deg.C		DO										DO
1.6.2.5	along the lamination	Electrical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.6.2.6	across the lamination	Electrical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.6.2.7	Tensile strength (modulus of elasticity)	mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.6.2.8	Cross breaking strength	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
	A) along the lamination	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
	B) across the lamination	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.6.2.9	Compressive strength	Mechanical	DO	DO	DO	CM TC	B	K	P	W / Z		N	DO
1.7	POLYSTER RESIN IMPREGNETED WEFTLESS GLASS TAPE (RESIN COATED GLASS TAPE)											E	Record review for first unit of each contract & rest on on surveillance basis.
1.7.1	Visual and dimentional check thisckness and width	Measurement & Visual	One sample per lot per thickness	EM Specification & Plant standard / BSPTCL specn.	No surface defects & dimensions within tolerance.	CM TC	A/B	J/K	S/P	W		N	DO
1.7.2	Checks for -		One sample per lot per thickness	EM Specification & Plant standard / BSPTCL specn.	EM Specification & Plant standard No./ BSPTCL specn.	CM TC	A/B	J/K	S/P	W		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.7.2.1	Shelf Life	Visual	DO	DO	Tape to be used within shelf life period. Glass Tape after expiry of Shelf Life shall not be used	CM TC	B	K	P	W		N	DO
1.7.2.2	Resin content	Visual	DO	DO	27 ± 2%	CM TC	B	K	P	W		N	DO
1.7.2.3	Seating (solder) test	Visual	DO	DO	Resign to flow & stick to other layers in 1 minute when pressed, with soldering iron at 160 ± 2°C	CM TC	B	K	P	W		N	DO
1.7.2.4	Wrap Yarns (No. of yarns per cm of width)	Visual	DO	DO	30 ± 3 (Ends / cm)	CM TC	B	K	P	W		N	DO
1.7.2.5	Softening point of Resin	Visual	DO	DO	235°C max.	CM TC	B	K	P	W		N	DO
1.7.2.6	Breaking load per turn of cured tape	Mechanical	DO	DO	200 N/mm min. for 03 mm thk and 250 N/mm for 0.4 mm thick	CM TC	B	K	P	W		N	DO
1.8	SYNTHETIC RUBBER BONDED CORK SHEET (if applicable)										E		
1.8.1	Visual check, thickness, length, width, marking of expiry date on sheet.	Measurement & Visual.	One sample of each size per lot	EM Specn. & Plant standard /BSPTCL specn.	Free from cracks & pinholes; dimensions with in tolerance; expiary date to be crimped	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on survelliance basis.
1.8.2	Checks for		One sample per lot per thickness	EM Specn. & Plant standard / BSPTCL specn./ IS4253	EM Specn. & Plant standard / BSPTCL specn./IS4253								DO
1.8.3	Hardness	Mechanical	DO	DO	70 +/-10 IRHD	CM TC	B	K	P	W / Z		N	DO
1.8.4	Tensile strength	Mechanical	DO	DO	1.5 N/mm2 (Min)	CM TC	B	K	P	W / Z		N	DO
1.8.5	Compressibility	Mechanical	DO	DO	25-35%	CM TC	B	K	P	W / Z		N	DO
1.8.6	Recovery	Mechanical	DO	DO	80 % min	CM TC	B	K	P	W / Z		N	DO
1.8.7	Compression set	Mechanical	DO	DO	85 % max.	CM TC	B	K	P	W / Z		N	DO
1.8.8	side flow under compression	Mechanical	DO	DO	18 % max.	CM TC	B	K	P	W / Z		N	DO
1.8.9	Flexibility	Mechanical	DO	DO	No breakage	CM TC	B	K	P	W / Z		N	DO
1.8.10	Aging in oil - flexibilty & change in volume	Physical	DO	DO	EM Specn. & Plant standard / BSPTCL specn./IS4253	CM TC	B	K	P	W / Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.8.11	pH value	Physical	DO	DO	5.0 - 8.5	CM TC	B	K	P	W / Z		N	DO
1.8.12	Density	Physical	DO	DO	0.7 - 0.9 g/ cc	CM TC	B	K	P	W / Z		N	DO
1.8.13	Sulpher content	Chemical	DO	DO	0.2 % (Max.)	CM TC	B	K	P	W / Z		N	DO
1.9	NITRILE RUBBER CORD & "O" RING											E	
1.9.1	Visual check, dia. Dimensions	Measurement & Visual.	One sample of each size per lot	EM Specn. & Plant Standard /EM Drg / BSPTCL specn.	Free from cracks & pinholes; dimensions with in tolerance;	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.9.2	Check for		One sample per lot per size	EM Specn. & Plant Standard /EM Drg / BSPTCL specn.	EM Specn. & Plant Standard /EM Drg / BSPTCL specn.								DO
1.9.3	Shore Hardness Check	Mechanical	DO	DO	70 +/-4 shore A	CM TC	B	K	P	W / Z		N	DO
1.9.4	Tensite Strength	Mechanical	DO	DO	10 Mpa (Min)	CM TC	B	K	P	W / Z		N	DO
1.9.5	Elongation at break	Mechanical	DO	DO	250% min.	CM TC	B	K	P	W / Z		N	DO
1.9.6	Compression Set	Mechanical	DO	DO	20% max.	CM TC	B	K	P	W / Z		N	DO
1.9.7	Resistance to corrision to metal	Chemical	DO	DO	No corrosion of metal	CM TC	B	K	P	W / Z		N	DO
1.9.8	Accelerated ageing in air at 100+/-1 deg C for 72 +/- 2 hrs.	Physical verification	One sample per lot	EM Specn. & Plant Standard /EM Drg / BSPTCL specn.	Change in hardness: -0/+10points , change in tensile strength -10% (max) & elongation change -35(max) %	CM TC	B	K	P	W / Z		N	DO
1.9.9	Accelerated ageing in oil at 100+/-1 deg C for 72 +/- 2 hrs.	Physical verification	DO	DO	Change in hardness: +0/-8 points (max.) , change in tensile strength -20% (max.) & volume change +20/-8 %	CM TC	B	K	P	W / Z		N	DO
1.9.10	Sulphur Content	Chemical	DO	DO	0.2 % max	CM TC	B	K	P	W / Z		N	DO
1.10	CONDENSER BUSHING											E	



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.10.1	Test on bushing oil before carrying out routine test on bushing: 1. BDV 2. Water content 3. Resistivity at 90 deg C 4. Tan- Delta at 90 deg C 5. IFT at 27 deg C	Electrical test	50% of offered lot for bushings of each rating	BSPTCL Approved MQP of condensor bushing manufacturer	Acceptance criteria : 1.) 70 kV (min) 2.) 5 ppm (max) 3.) 10×10^{12} ohm-cm (min) 4.) 0.005 (max) 5.) 35 mN/m (min)	CM TC	B/D	K/L	U/V	W /Z		Y	In case of indigeneous (oil tests to be carried out either at bushing manufacturer's works or at 3rd party lab *) (as per bushing manufacturer MQP). In case of Imported bushings, Record Review during bushing
1.10.2	Visual check, fitting of all accessories,mounting dimensions & type	Visual	100%	BSPTCL appr. Drg & Tech. Data sheet , BSPTCL approved MQP for condensor bushing / BSPTCL Spec.	BSPTCL appr. Drg & Tech. Data sheet , BSPTCL approved MQP for condensor bushing / BSPTCL Spec.	CM TC	B	K	U	W /Z		Y	For all bushing including spare bushings in case of indigeneous(as per bushing manufacturer MQP); for complete set of bushings of one transformer of each contract for imported bushings balance record review
1.10.3	Routine test measurement of tan delta & capacitance at ambient temp. Dry. P. f. voltage withstand test. Measurement of p.d. quantity, lightning impulse with stand. Test tap insulation test & pressure test for leakage of internal filling as specified in IEC 60137.	Electrical	100%	IEC 60137 / BSPTCL appr. Drg & Tech. Data sheet , BSPTCL approved MQP of condensor bushing manufacturer / BSPTCL Spec.	IEC 60137 / BSPTCL appr. Drg & Tech. Data sheet , BSPTCL approved MQP of condensor bushing manufacturer / BSPTCL Spec. Tan delta value for all type of bushing should be less than 0.4 % at ambient temperature.	CM TC	B	K	U	W /Z		Y	
TYPE TEST : ALL TYPE TEST REQUIRED AS PER TS OF THE SUBJECT CONTRACT IN QUESTION NEED TO BE CONDUCTED / APPROVAL FROM BSPTCL ENGG. TO BE OBTAINED.													
1.10.A	RIP Bushing (if applicable)		All routine tests as per BSPTCL approved MQP of RIP bushing manufacturer, IEC 60137 /BSPTCL Specification and test on silicon insulator as per IEC 61462/62217									E	CIP
All type test required as per the contract in question need to be conducted / approval to be obtained from BSPTCL Engg.													
1.11	Porcelain Bushing											E	DO
1.11.1	Visual check & dimensional check	Measure-ment & Visual	100%	IS8603/IS3347/IS2099 & BSPTCL SPEC.	No surface defects & dimensions with in tolerance	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.11.2	All Routine test including Power frequency voltage withstand test as per IS 2099	Electrical	100%	DO	IS8603/IS3347/IS2099 & BSPTCL SPEC.	CM TC	B	K	P	W		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.12	CURRENT TRANSFORMER											E	
1.12.1	Visual check, check for dimensions (ID, OD, thickness) & completeness	Measurement & Visual.	100% (10% dimension check)	IS 2705 /IEC 60044 BSPTCL Specification	No surface defects & dimensions with in tolerance	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.12.2	Accuracy, Ratio, Power frequency dry withstand test , over voltage inter turn, Verification of terminal marking & polarity, exciting current test for P.S. class CT Secondary wdg. Resistance for PS class CT	Electrical	100%	DO	As per IS 2705 /IEC 60044 BSPTCL Specification	CM TC	B	K	P	W /Z		N	DO
1.13	SECONDARY TERMINAL BOARD											N	DO
1.13.1	Visual check	Visual	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 5	EM Drg./ BSPTCL specn.	No surface defects	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.13.2	Dimensions	Measure-ment	One sample per lot	DO	Dimensions with in tolerance	CM TC	A/B	J/K	S/P	W		N	DO
1.13.3	Electrical voltage withstand i) Between terminals ii) Between terminal & mounting holes	Electrical	100%	DO	5.0 KV AC for 1 minute	CM TC	B	K	P	W		N	DO
1.13.4	Oil Pressure Test	Testing	100%	DO	No leakage at 2 Kg/ cm2 for 30 min. With hot transformer oil at 110 deg. C	CM TC	B	K	P	W		N	DO
1.14	BUCHHOLZ RELAY											E	
1.14.1	Visual and dimension check	Visual.	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 3 91 to 280 13	EM Specn. & Plant Standard / IS 3637 / BSPTCL specn.	No surface defects & dimensions with in tolerance	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.14.2	Porosity & element test, high voltage & insulation resistance, gas volume test, Loss of oil & surge test / float operation test	Electrical / Mechanical / Physical	100%	-do-	EM Specn. & Plant Standard / IS 3637 / BSPTCL specn.	CM TC	B	K	P	W /Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.14.3	TYPE TEST : ALL TYPE TEST REQUIRED AS PER TS OF THE SUBJECT CONTRACT IN QUESTION NEED TO BE CONDUCTED / APPROVAL FROM BSPTCL ENGG. TO BE OBTAINED.												
1.15	TERMINAL CONNECTOR (If applicable)											E	
1.15.1	Visual & dimensional check	Measurement & Visual.	One sample per lot	EM Specn. & Plant Standard /EM Drg IS 5561 / BSPTCL specn.	No surface defects and dimensions within tolerance as per EM drg.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.15.2	All routine & acceptance test as per IS-5561- tensile test , Resistance test & Galvanizing test (wherever applicable)	Mech./ Electrical	EM Specn. & Plant Standard / IS 5561 / BSPTCL specn.	DO	IS 5561	CM TC	B	J/K	S/P	W/Z		Y	DO
	TYPE TEST : ALL TYPE TEST REQUIRED AS PER TS OF THE SUBJECT CONTRACT IN QUESTION NEED TO BE CONDUCTED / APPROVAL FROM BSPTCL ENGG. TO BE OBTAINED.(if applicable)												
1.16	MARSHALLING BOX. (CONTROL CABINET) (Surface cleaning before painting by 7 tank process)											E	
1.16.1	Visual check, (Including workmanship of internal arrangements, ferruling, labelling,accessories etc.) Dimensions , paint thickness. Adhesion test, paint shade etc.	Measurement & Visual.	100%	BSPTCL appvd. Drg./BSPTCL Specification/EM Plant Standard	BSPTCL appvd. Drg./BSPTCL Specification/EM Plant Standard	CM TC	A/B	J/K	S/U	W/Z		S	



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.16.2	Routine test-HV test at 2KV for 1 minute between all power terminal to earth, insulation resistance at 500 V, verification of wiring & its routing, functional test-at min. rated & maximum operating voltage as per BSPTCL approved drg. Electrical control operations interlocks & sequentials ,operations. Mechanical test manual operation of equipments, switches & contactors & check for make & type of instruments / components.	Functional	100%	DO	As per BSPTCL appvd. Drg./BSPTCL Specification/EM Plant Standard	CM TC	A/B	J/K	S/U	W/Z		S	
TYPE TEST : ALL TYPE TEST REQUIRED AS PER TS OF THE SUBJECT CONTRACT IN QUESTION NEED TO BE CONDUCTED / APPROVAL FROM BSPTCL ENGG. TO BE OBTAINED.													
1.17	AIR CELL (FLEXIBLE SEPARATOR)											E	
1.17.1	Surface finish of completed air cell & dimensional check.	Measurement & Visual.	100%	EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	No surface defects & dimensions with in tolerance	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.17.2	Routine tests:- Ten times inflation & deflation test at 0.105kg/cm2 & pressure test at 0.105kg/cm2 for 24 hrs.	Mechanical / Leakage Verification	100%	DO	As per EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	CM TC	B	K	P	W / Z		N	DO
1.17.3	Routine tests on basic fabric, oil side coating compound, air side under/outer coating compound & coated fabric.	Mechanical	One sample per lot of raw matt / processed compound	IS3400/BSPTCL specn/ EM Specn. & Drg.	As per IS3400/ BSPTCL specn/ EM Specn. & Drg	CM TC	B	K	P	W / Z		N	DO
TYPE TEST : ALL TYPE TEST REQUIRED AS PER TS OF THE SUBJECT CONTRACT IN QUESTION NEED TO BE CONDUCTED / APPROVAL FROM BSPTCL ENGG. TO BE OBTAINED.													
1.18	ROLLER ASSEMBLY (If applicable)											E	



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.81.1	Visual , dimensional check & paint check	Measurement & Visual.	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 5 91 to 280 13	EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on survelliance basis.
1.81.2	Mechanical properties and chemical composition of raw matl used for shaft and roller forging.	Mechanical / Chemical	One sample per melt / heat treatment batch	DO	DO	CM TC	B	K	P	W		N	DO
1.19	OIL & WINDING TEMP. INDICATOR (LOCAL & REMOTE)											E	
1.19.1	Visual & dimensional check	Measurement & Visual.	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 5	EM Specn. & Plant Standard no.QA/MS/AN-010 /EM Drg./ BSPTCL specn.	No damage & dimensions are with in tolerance as per drg.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on survelliance basis.
1.19.2	Calibration check for verification of accuracy	Electrical	100%	-do-	Accuracy should be +/- 3 deg C or better	CM TC	B	K	P	W /Z		N	DO
1.19.3	2 KV HV test for 1 minute between all terminals & earth	Electrical	100%	-do-	Should withstood 2 KV AC , 50 Hz for 1 minute	CM TC	B	K	P	W /Z		N	DO
1.19.4	Switch operation check	Electrical	100%	-do-	Switch operation should shall be within + / - 2.5 Deg. C of switch setting	CM TC	B	K	P	W /Z		N	DO
TYPE TEST : ALL TYPE TEST REQUIRED AS PER TS OF THE SUBJECT CONTRACT IN QUESTION NEED TO BE CONDUCTED / APPROVAL FROM BSPTCL ENGG. TO BE OBTAINED.													
1.20	RTD TYPE REMOTE AND WINDING TEMP. INDICATOR											E	
1.20.1	Visual & dimensional check	Measurement & Visual.	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 5	EM Specn. & Plant Standard no.QA/MS/AN-010 /EM Drg./ BSPTCL specn.	No damage & dimensions are with in tolerance as per EM drg.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on survelliance basis.



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.20.2	Calibration, HV test (2000 V for one minute) Insulation resistance by 500 V meggar & sensor resistance	Electrical	100%	DO	EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	CM TC	B	K	P	W		N	DO
1.21	PRESSURE RELIEF VALVE (PRV / PRD)											E	
1.21.1	Visual & dimensional check	Measurement & Visual.	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 5	EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on surveillance basis.
1.21.2	Air pressure test	Pressure test	100%	DO	should operate at specified pressure (in GTP) with tolerance of +/-0.07 kg/cm2	CM TC	B	K	P	W /Z		N	DO
1.21.3	Liquid pressure test (Operating pressure)	Pressure test	100%	DO	should operate at specified pressure (in GTP) with tolerance of +/-0.07 kg/cm2	CM TC	B	K	P	W /Z		N	DO
1.21.4	Leakage test at 75% of	Testing	100%	DO	No Leakage	CM TC	B	K	P	W /Z		N	DO
1.21.5	Switch Contact operation test	Testing	100%	DO	Status of contact to be changed after operation	CM TC	B	K	P	W /Z		N	DO
1.21.6	Dielectric test (2 KV for 1 min.) between each terminals & body of PRV	Electrical	100%	DO	Shall withstand.	CM TC	B	K	P	W /Z		N	DO
TYPE TEST : ALL TYPE TEST REQUIRED AS PER TS OF THE SUBJECT CONTRACT IN QUESTION NEED TO BE CONDUCTED / APPROVAL FROM BSPTCL ENGG. TO BE OBTAINED.													
1.22	MAGNETIC OIL LEVEL GAUGE (MOLG)											E	
1.22.1	Visual & dimensions check	Measurement & Visual.	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 5	EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	EM Specn. & Plant Standard /EM Drg./ BSPTCL specn.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on surveillance basis.
1.22.2	Calibration check for empty & full.	Functional	100%	DO	DO	CM TC	B	K	P	W		N	DO
1.22.3	2 KV test for 1 min between terminals & body	Electrical	100%	DO	DO	CM TC	B	K	P	W		N	DO
1.22.4	Leak test with air	Pressure test	100%	DO	DO	CM TC	B	K	P	W		N	DO
1.22.5	Switch operation test	Verification	100%	DO	DO	CM TC	B	K	P	W		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
TYPE TEST : ALL TYPE TEST REQUIRED AS PER TS OF THE SUBJECT CONTRACT IN QUESTION NEED TO BE CONDUCTED / APPROVAL FROM BSPTCL ENGG. TO BE OBTAINED.													
1.23	GAS COLLECTING DEVICE											E	
1.23.1	Visual & dimension check	Measurement & Visual.	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 5	EM Drg / BSPTCL spec	As per EM Drg / BSPTCL spec	CM TC	B	K	P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.23.2	Pressure Test/ Leak test	Mechanical	100%	DO	No leakage at 0.75 kg cm x cm for 30 minutes	CM TC	B	K	P	W		N	DO
1.24	GATE VALVES (CAST IRON & GUN METAL)											E	
1.24.1	Visual & dimensional check	Measurement & Visual.	one sample per lot of each size	EM Specn. & Plant Standard / EM Drg./ BSPTCL specn.	No damage & dimensions are with in tolerance as per EM drg.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.24.2	Check for raw material for valve body , gate wedge , spindle & Gland	Chemical	Lot wise	DO	EM Specn. & Plant Standard / EM Drg./ BSPTCL specn.	CM TC	B	K	P	W		N	DO
1.24.3	1) GUN METAL VALVE :- a) Body test at 1.5 Mpa min. for 2 minutes (Hydraulic) b) Seat & back seat leakage test at 1 Mpa min. for 2 minutes (air pressure) c) Seepage test at min. 2 kg/cm2 for 12 Hrs.	Pressure Test	100% (10% for seepage test)	DO	DO	CMTC	B	K	P	W		N	DO
	2) CAST IRON VALVE: a) Body test at 1.5 Mpa min. for 2 minutes (Hydraulic) b) Seat & back seat leakage test at 1 Mpa min. for 2 minutes (air pressure) c) Seepage test at min. 2 kg/cm2 for 12 Hrs.	Pressure Test	100% (10% for seepage test)	DO	DO	CMTC	B	K	P	W		N	DO
1.25	SILICAGEL BREATHER											E	



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.25.1	Visual & dimensional check	Measure-ment & Visual	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 5	EM Specn. & Plant Standard no. QA/MS/AN- 029/ EM Drg./ BSPTCL specn	Gel should be blue in colour & dimensions are with in tolerance as per EM drg.	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on survelliance basis.
1.25.2	Pressure test by blanking oil cup end	Testing	100%	DO	No leakage	CM TC	B	K	P	W / Z		N	DO
1.26	INSULATING OIL											E	
1.26.1	Drums for insulating oil a) Visual check of inside cleanliness and outside coating & painting. b) Dimensional check Thickness , height & Diameter c) Leakage test on drum d) Drop Test e) Hydraulic Test	Visual , Measurement & Test	IS 1783 part 1 / EM specification	IS 1783 part 1 / EM specification/MSAN 005 rev 0	IS 1783 part 1 / EM specification/MSAN 005 rev 0	CM TC	B	K	P	W / Z		N	Record review for first unit of each contract & rest on on survelliance basis.
1.26.2	INSULATION OIL FOR FILLING AT SITE (All test to be conducted as per BSPTCL applicable TS of subject contract) oil should be virgin high grade inhibited, conforming to IEC-60296 and BSPTCL specified parameters											E	
1.26.3	FUNCTION												
1.26.4	Viscosity at 100 deg.C	Physical	IS:6855	As per BSPTCL Tech Spec. of subject contract	(Max) 3 mm ² /s	CM TC	B	K	U	W / Z		N	At Oil Manufacturer works.
1.26.5	Viscosity at 40 deg. C	Physical	IS:6855	DO	(Max) 12 mm ² /s	CM TC	B	K	U	W / Z		N	DO
1.26.6	Viscosity at -30 deg. C	Physical	IS:6855	DO	(Max) 1800 mm ² /s	CM TC	B	K	U	W / Z		N	DO
1.26.7	Appearance	Visual	IS:6855	DO	Oil shall be clear , transparent & free from suspended matter or sediment	CM TC	B	K	U	W / Z		N	DO
1.26.8	Pour point	Physical	IS:6855	DO	(Max) -40 deg.C	CM TC	B	K	U	W / Z		N	DO
1.26.9	Water content a) For bulk supply b) For delivery in drum	Chemical	IS:6855	DO	30 mg/kg (max.) 40 mg/kg (max.)	CM TC	B	K	U	W / Z		N	DO
1.26.10	Electric strength (BDV)	Electrical	IS:6855	DO	50 kV min. (New unfiltered Oil) 70 kV min. (After treatment)	CM TC	B	K	U	W / Z		N	DO
1.26.11	Density at 20° C	Physical	IS:6855	DO	0.820 -0.895 g/ml	CM TC	B	K	U	W / Z		N	DO
1.26.12	Tan delta at 90° C	Electrical	IS:6855	DO	0.0025 Max.	CM TC	B	K	U	W / Z		N	DO
1.26.13	Resistivity at 90° C	Electrical	IS:6855	DO	150 x10 ^12 Ohm - cm (min.)	CM TC	B	K	U	W / Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.26.14	Negative impulse testing kVp at 25 deg.C	Electrical	IS:6855	DO	145 (Min.)	CM TC	B	K	U	W / Z		N	DO
1.26.15	Carbon type composition (% of Aromatic , Paraffins & Naphthalene)	Chemical	IS:6855	DO	For Aromatic 4 to 12 % (Max.) Paraffins < 50 % & Balance shall be Naphthenic compound	CM TC	B	K	U	W / Z		N	DO
Refining / Stability													
1.26.16	Acidity	Chemical	IS:6855	DO	0.01 mg KOH/ g (max.)	CM TC	B	K	U	W / Z		N	DO
1.26.17	Interfacial Tension at 27 Deg. C	Physical	IS:6855	DO	0.04 N/m (min.)	CM TC	B	K	U	W / Z		N	DO
1.26.18	Total Sulphur content	Chemical	IS:6855	DO	0.15 % (Max.)	CM TC	B	K	U	W / Z		N	DO
1.26.19	Corrosive Sulphur (IEC 62535)	Chemical	IS:6855	DO	Non corrosive on copper & paper	CM TC	B	K	U	W / Z		N	DO
1.26.20	Corrosive Sulphur (ASTM D 1275 B)	Chemical	IS:6855	DO	Non corrosive	CM TC	B	K	U	W / Z		N	DO
1.26.21	Presence of oxidation inhibitor	Chemical	IS:6855	DO	0.08 % (min.) to 0.4 % (max.), Oil should contains no additives	CM TC	B	K	U	W / Z		N	DO
1.26.22	2- Furfural content	Chemical	IS:6855	DO	25 micrograms/ litre (Max.)	CM TC	B	K	U	W / Z		N	DO
Performance													
1.26.23	Oxidation stability a) Total Acidity b) Sludge by mass c) Tan delta at 90 Deg.C	Chemical	IS:6855	DO	Max. 0.30 mg KOH/g: Max. 0.05 % : Max. 0.05	CM TC	B	K	U	W / Z		N	DO
1.26.24	Gassing	Chemical	IS:6855	DO	No general req.	CM TC	B	K	U	W / Z		N	DO
1.26.25	Oxidation stability by RBOT (Rotating Bomb Test)	Chemical	IS:6855	DO	220 Mints.	CM TC	B	K	U	W / Z		N	DO
Environment , Health & Safety (EHS)													
1.26.26	Flash Point	Physical	IS:6855	DO	135 deg.C	CM TC	B	K	U	W / Z		N	DO
1.26.27	PCA Content	Chemical	IS:6855	DO	Max. 3%	CM TC	B	K	U	W / Z		N	DO
1.26.28	PCB Content	Chemical	IS:6855	DO	Not detctable (Less than 2 mg/ Kg)	CM TC	B	K	U	W / Z		N	DO
1.26.29	Checking of oil quantity	Verification	IS : 6855	BSPTCL contract	BSPTCL contract/Appvd GTP/Appvd Drg	CM TC	B	K	U	W / Z		Y	-DO-



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.26.30	Proper sealing of oil drums before dispatch & visual check for leakage & damage of drums	Verification	100%	BSPTCL spec.	No oil leakage from the filled drums; drums shall be free from damages & every drum is to be sealed	CM TC	B	K	U	W / Z		Y	-DO-
1.27	STEEL FABRICATED PARTS												
1.27.1	Steel for Tank Cover, Top tank, Bottom Tank, Conservator, Turrets & Accessories (fabrication)												
1.27.1.1	Visual Check for finish & dimensions	Visual & Measurement	100%	EM spec & Plant std / BSPTCL spec./ IS2062	No surface defects & dimensions are with in tolerance	CM TC	B	K	Q	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.27.1.2	Chemical composition	Chemical	1 sample per lot	-do-	EM spec & Plant std / BSPTCL spec./ IS2062/BS4360	CM TC	B	K	P	W / Z		N	DO
1.27.1.3	Mechanical Properties	Mechanical	1 sample per lot	-do-	-do-	CM TC	B	K	P	W / Z		N	DO
1.27.1.4	Ultrasonic Test on bottom Plate of tank (16 mm & above)	Mechanical	100%	-do-	As per ASTM STD.		B/D	K/L	Q/V	W / Z		Y	Test report will be submitted for review during final inspection
1.28	Cold rolled carbon steel sheet annealed - drawing, for Radiator												
1.28.1	Visual check for finish & dimensions	Measurement & Visual.	100%	EM spec & Plant std / BSPTCL spec./ IS:513 / DIN1623	No surface defects & dimensions are with in tolerance	CM TC	B	K	Q	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.28.2	- Chemical composition	Chemical	1 sample per lot	-do-	EM spec & Plant std / BSPTCL spec./ IS:513 / DIN1623	CM TC	B	K	P	W / Z		N	DO
1.28.3	- Mechanical Properties	Mechanical	1 sample per lot	-do-	-do-	CM TC	B	K	P	W / Z		N	DO
1.29	Mild steel tube/carbon steel pipe (for pipe work, sub-assembly) & for lifting bollard												
1.29.1	Visual check for finish & dimensions	Visual	100%	IS-3589 /IS1239 / EM spec & plant std / BSPTCL spec.	No surface defects & dimensions are with in tolerance	CM TC	B	K	Q	W		N	DO
1.29.2	Chemical composition	Chemical	1 sample per lot	-do-	BSPTCL spec. and approved drawings.	CM TC	B	K	P	W / Z		N	DO
1.29.3	Mechanical Properties	Mechanical	1 sample per lot	-do-	-do-	CM TC	B	K	P	W / Z		N	DO
1.29.4	Welding Procedure Spec (WPS) & welder qualification for 1.30, 1.31 & 1.32	Mechanical	100%	ASME Sec IX and EM spec & plant std & BSPTCL spec	ASME Sec IX and EM spec & plant std & BSPTCL spec	CM TC	B	K	Q	W / Z		N	Review of BSPTCL approval during BSPTCL inspection



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

		Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016								
			Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision								
Section : Raw Material Inspection													
S.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	
1.29.5	Visual check for Welding Electrode for 1.30, 131 & 1.32	Visual	One sample of each type per lot	-do-	-do-	CM TC	B	K	Q	W / Z		N	Record review for first unit of each contract & rest on on surveillance basis.
1.30	Tank cover, Top tank, Bottom tank, Turret, Conservator & Accessories. (Fabrication)											E	
1.30.2.1	Check for fitup for butt welds on tank walls, base & cover	Visual	100%	EM. Drg / EM Specn & Plant std	As per EM Specn /fabrication drg.	CM TC	B	K	Q	W / Z		N	Record review for first unit of each contract & rest on on surveillance basis.
1.30.2.2	DP Test on load bearing welds e.g. lifting lugs/bollards. DP test on jacking pads	Mechanical	Each Tank	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q/U	W / Z		Y	For one transformer tank of each rating of each contract of each vendor at tank manufacturer works.
1.30.2.3	Radiographic Examination on butt welds in bottom plate of bottom Tank(if any)	Mechanical	Each Tank	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.		B	K	Q	W / Z		Y	Test report will be submitted for review during final inspection
1.30.2.4	Visual & dimensional check after final welding including rim flatness, position of guides & earth connection, projection or matching of tank with cover , dimensions of roller mounting pad with std. fixture of roller by turning by 90 Deg.	Visual & Dimension	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q	W / Z		N	Record review for first unit of each contract & rest on on surveillance basis.
1.30.2.5	D.P test on butt welds after fit up	Mechanical	Each tank	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q	W / Z		N	DO
1.30.2.6	Air leakage test on assembled tank with turrets & on conservator	Mechanical	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q	W / Z		N	DO
1.30.2.7	Visula check after air leakage test	visual	DO	DO	No surface defect	CM TC	B	K	Q	W / Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.30.2.8	Air Pressure test & Vacuum Test (PT/VT) on Tank	Deflection verification	Each Tank	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q/U	W / Z		Y	For one transformer tank of each rating of each contract at tank manufacturer works.
1.30.2.9	Surface cleaning by shot blasting (for all items)	Visual	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q/U	W / Z		Y	Record review for first unit of each contract & rest on on surveillance basis.
1.30.2.10	Visual check of paint shade, paint film thickness- inside & outside & film adhesion test and Record review of Previous stages	Visual	100%	-do-	-do-	CM TC	B	K	Q/U	W / Z		Y	Record review for first unit of each contract & rest on on surveillance basis.
1.31	RADIATOR											E	
1.31.1	DP test on lifting lug welds	Mechanical	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.								Record review for first unit of each contract & rest on on surveillance basis.
1.31.2	Dimensional Check after final welding -flange centre & over all dimensions.	Measure-ment & Visual	100%	-do-	-do-	CM TC	B	K	Q	W/Z		N	
1.31.3	Air pressure test on complete Radiator assembly	Testing	100%	2 Kg/cm2 for 30 minutes	No leakage	CM TC	B	K	Q/U	W/Z		Y	For one set of transformer radiators of each rating of each contract of each vendor at manufacturer works and balance record review on surveillance
1.31.4	Surface cleaning of header support & bracing details by shot blasting	Visual	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.		B	K	Q	W/Z		Y	Record review for first unit of each contract & rest on on surveillance basis.
1.31.5	Visual check of paint shade, paint film thickness - out side film adhesion test.	Visual	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q	W/Z		Y	DO
1.32	PIPEWORK INCLUDING HEADER ASSEMBLY FOR												
1.32.1	Dimensional check	Measurement	100%	EM Drg.	As per EM Drg.	CM TC	B	K	Q	W/Z		Y	Record review for first unit of each contract & rest on on surveillance basis.



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.32.2	Air pressure test on pipe work & header assembly for radiator	Testing	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q/U	W/Z		Y	For one transformer tank of each rating of each contract of each vendor at tank manufacturer works, balance record review on surveillance basis
1.32.3	Surface cleaning during by sand / shot blasting	Visual	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q	W/Z		Y	Record review for first unit of each contract & rest on on surveillance basis.
1.32.4	Visual check after one coat of primer , visual check for inside the pipe with BOROSCOPE (below & including 50 NB)	Visual	100%	-do-	BSPTCL spec. and approved drawings.	CM TC	B	K	Q	W/Z		Y	Test report will be submitted for review during final tank clearance.
1.32.5	Visual check of paint shade , paint thickness -outside film adhesion test.	Visual	100%	-do-	BSPTCL spec. and approved drawings.	CM TC	B	K	Q	W/Z		Y	Record review for first unit of each contract & rest on on surveillance basis.
1.32.6	Matching of accessories , conservator, pipe work header with respective tank with photograph.	Visual	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	Q	W/Z		Y	Test report will be submitted for review during final tank clearance.
1.33	ON LOAD TAP CHANGER (For Power Transformers)											E	
1.33.1	Mechanical operation test of divertor switch (Endurance test)	Electrical / Mechanical	Each OLTC	IEC 60214 / IS 8468 /EM Specn / BSPTCL Spec	5000 Operation (min)	CM TC	B	K	Q/U	W/ Z		Y	On one unit of each type & size against each contract of each vendor & record review on surveillance basis for rest.
1.33.2	Sequence Test	Electrical	Each OLTC	DO	Switching time shall be within limit	CM TC	B	K	Q/U	W/ Z		Y	
1.33.3	Pressure leak test of divertor switch compartment	Mechanical	Each OLTC	DO	No Leakage	CM TC	B	K	Q/U	W/ Z		Y	DO
1.33.4	Mechanical test of tap selector with motor drive	Electrical / Mechanical	Each OLTC	DO	500 satisfactory operations from one extreme position to other	CM TC	B	K	Q/U	W/ Z		Y	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.33.5	Operation test of complete OLTC including functional check of driving mechanism	Electrical	Each OLTC	Satisfactory operation during final operation test and functional check	Satisfactory operation during final operation test and functional check	CM TC	B	K	Q/U	W/ Z		Y	DO
1.33.6	HV test on auxillary ckt	Electrical	Each OLTC	IEC 60214 / IS 8468 /EM Specn, PO & Plant stdn / BSPTCL Spec	Withstood 2 kv (min) for 1 minute	CM TC	B	K	Q/U	W/ Z		Y	DO
1.33.7	Physical & Dimension check as per drawing including verification of fibre glass bar used in divertor switch	Visual , Verification & measurement	Each OLTC	Manufacturers Drawing	Manufacturers Drawing	CM TC	B	K	Q/U	W/ Z		Y	DO
1.33.8	Visual check of paint shade , paint thickness on motor drive panel	Visual & Verification	Each OLTC	IEC 60214 / IS 8468 /EM Specn / BSPTCL Spec.	IEC 60214 / IS 8468 /EM Specn / BSPTCL Spec.	CM TC	B	K	Q/U	W/ Z		Y	DO
TYPE TEST : All type test required as per TS of the subject contract in question need to be conducted / approval from BSPTCL Engineering to be obtained													
1.34	OIL PUMP (For Power Transformers)											E	
1.34.1	Type & Make	Visual	100%	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CMTC	B	K	P	W/Z		N	Record review on first unit of each contract & rest on surveillance basis
1.34.2	HV (Dielectric) test	Electrical	100%	-do-	DO	CMTC	B	K	P	W/Z		N	DO
1.34.3	Locked Rotor test	Electrical	100%	-do-	DO	CMTC	B	K	P	W/Z		N	DO
1.34.4	Oil Pressure Test on Pump at 4 Kg/ Cm Sq. for 30 minutes	leakage verification	100%	-do-	No leakage	CMTC	B	K	P	W/Z		N	DO
1.34.5	Performance test: Input, output & Discharge	Electrical	100%	-do-	-do-	CMTC	B	K	P	W/Z		N	DO
TYPE TEST : All type test required as per TS of the subject contract in question need to be conducted / approval from BSPTCL Engineering to be obtained													
1.35	COOLING FAN & MOTOR ASSEMBLY (For Power Transformer)											E	
1.35.1	Visual check & Dimensional check	Visual	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 3	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	P	W/ Z		N	Record review for first unit of each contract & rest on on surveillance basis.
1.35.2	Routine and acceptance test as per IS 2312	Electrical test	100%	-do-	-do-	CM TC	B	K	P	W/ Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
TYPE TEST : All type test required as per TS of the subject contract in question need to be conducted / approval from BSPTCL Engineering to be obtained													
1.36	BUTTERFLY VALVE											E	
1.36.1	Visual Inspection	Visual	100%	EM Specn. & Plant Standard noBC-219. /EM Drg./ BSPTCL specn.	No Surface defects	CM TC	A/B	J/K	S/P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.36.2	Dimensional Check	Measurement	One Sample per lot	DO	Within tolerance	CM TC	B	K	P	W		N	-DO-
1.36.3	Pressure test through body & spindle	Measurement	100%	DO	No leakage at 5 Kg/ cm2 for 30 mints.	CM TC	B	K	P	W		N	-DO-
1.36.4	Pressure test diphragm	Measurement	100%	DO	Max. permissible leak rate through diphragm -6 drops/ min. at 1.5 kg./cm2								-DO-
1.36.5	Oil seepage test (Oil of 105± 5 deg.C at pressure of 2 kg/Sq.cm for 24 Hrs.)	Measurement	One Sample per lot	DO	No leakage through body & spindle . Leakage through disc - Max. 6 drops / min.	CM TC	B	K	P	W		N	-DO-
1.36.6	Material Composition (Disc)	Measurement	One Sample per lot	EM Drg./ IS 2062	Grade. Fe410-WA As per table 1 of IS 2062	CM TC	B	K	P	W		N	-DO-
1.36.7	Material composition (Housing)	Measurement	One Sample per lot	EM Drg. / IS 210	Grade.FG 260	CM TC	B	K	P	W		N	-DO-
1.37	OIL FLOW INDICATOR (For Power Transformers)											E	
1.37.1	Visual check & Dimensional check	Visual	IS 2500Pt 1 AQL = 4% Inspection level1 Lot Sample Size Size 2 to 90 3	BSPTCL spec. and approved drawings.	BSPTCL spec. and approved drawings.	CM TC	B	K	P	W		N	Record review for first unit of each contract & rest on on surveillance basis.
1.37.2	Full flow check	Verification	100%	-do-	-do-	CM TC	B	K	P	W		N	DO
1.37.3	Alarm & Trip operation check	Verification	100%	-do-	-do-	CM TC	B	K	P	W		N	DO
1.37.4	Dielectric Test	Electrical test	100%	-do-	Should withstand 2 kv one minute between each terminal & body	CM TC	B	K	P	W		N	DO
1.37.5	Leak test	Pressure test	100%	-do-	No leakage at 7 kg / cm x cm for 2 minutes	CM TC	B	K	P	W		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.38	Digital RTCC Panel (tap changer control & Transformer monitoring system for power transformer) - if applicable												
1.38.1	Surface cleaning before painting by 7 Tank process (If called in TS for subjected contract)	Verification	100%	IEC60214/ BSPTCL TS/manufacturer Drg/ BSPTCL agreed painting	IEC60214/ BSPTCL TS/manufacturer Drg/ BSPTCL agreed painting	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	Record review on first unit & rest on surveillance basis
1.38.2	Dimension and visual check of paint shade,Paint film thickness, film adhesion test	Visual & Measurement	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	For first unit of each contract & rest record review on surveillance basis
1.38.3	Check for connection, wiring, assembly	Visual	DO	BSPTCL Spec./ BSPTCL approved drawing	BSPTCL Spec./ BSPTCL approved drawing	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.4	Check for make & type of instruments/components	Visual	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.5	HV test : 2 KV for 1 min insulation test between all live terminal and earth	Electrical	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.6	Measurement of insulation resistance by 500 volt megger	Electrical	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.7	Check for Remote/Local/Auto/Manual Function	Electrical	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.8	Check for auxillary and PT supply voltage range (if applicable)	Visual	DO	Work instructions/BSPTCL Spec./ BSPTCL approved drawing	Work instructions/BSPTCL Spec./ BSPTCL approved drawing	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.9	Check for CT range (if applicable)	Visual	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.10	Check for all LED indication	Visual	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
Checks on digital RTCC Relay / Automatic Voltage Regulating Relay (AVR)													
1.38.11	Voltage & Current measurement	Visual & Measurement	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.12	Check for panel switches	Visual	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.13	Check for function of communication interface	Test	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	
1.38.14	Test of complete function includes tap position indication & raise/lower command	Test	DO	DO	DO	CMTC/EMTC	A/B	K	Q/U	W/Z		Y	



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
TYPE TEST : All type test required as per TS of the subject contract in question need to be conducted / approval from BSPTCL Engineering to be obtained													
1.39	Online Dissolved Gas & Moisture Monitor (If applicable) (Multigas)										E	Record review for first unit of each contract & rest on on surveillance basis.	
1.39.1	verification of make and model		100%	BSPTCL Approved make and model (as per COV)	As per supplier's TC	CM TC	B	K	P	W/Z		N	DO
1.39.2	Visual check	Visual	100%	BSPTCL Technical Specification of subject Contract / As per CM data sheet	As per manufacturers certificate	CM TC	B	K	P	W/Z		N	DO
1.39.3	Visual dimension check	Measurement	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.4	Dissolved multigas sensor	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.5	Temperature sensing device	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.6	Oil circulating pump	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.7	Heating / Cooling element	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.8	Bubble eliminator test	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.9	Alarm relay functioning	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.10	Communication port	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.11	Dissolved water sensor	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.12	Calibration of gas cylinder	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.13	Helium gas cylinder	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.14	Leak / Blockage	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.39.15	Start up for display mother board LEDS , Fans	DO	DO	DO	DO	CM TC	B	K	P	W/Z		N	DO
1.40	Online insulating oil drying system (if applicable)										E	Record review for first unit of each contract & rest on on surveillance basis.	
1.40.1	Visual check	Visual	100%	BSPTCL tech spec. of subject contract / As per CM data sheet	No damage as per drawing	CM TC	B	K	P	W/Z		N	DO
1.40.2	Pressure / Leak test	DO	DO	DO	No leakage	CM TC	B	K	P	W/Z		N	DO
1.40.3	All other test as per supplier / Manufacturer standard	DO	DO	DO	As per CM TC certificate	CM TC	B	K	P	W/Z		N	DO
1.41	Optical Sensor (If applicable)										E		
1.41.1	Visual & dimension check	Measurement	100%	BSPTCL tech spec. of subject contract / As per CM data sheet		CM TC	B	K	P	W/Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item:Power Transformers (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section : Raw Material Inspection

S.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	
1.41.2	Lightning impulse test (Type test)	Electrical	One sample	ASTM D 3426	500kV for a gap of 25 mm wiothout break down or flash over	CM TC	B	K	P	W /Z		N	DO
1.41.3	Switching impulse test (Type test)	Electrical	One sample	ASTM D 129	360kV for a gap of 25 mm wiothout break down or flash over	CM TC	B	K	P	W /Z		N	Record review for first unit of each contract & rest on on survelliance basis.
1.41.4	PD measurement (Type test)	Electrical	One sample	ASTM D 2413	Less than 10 pc at electric strength of 4.7 kv/mm , 70 kv on 15 mm gap or 140 kv on 30 mm gap	CM TC	B	K	P	W /Z		N	DO
1.42	Flow sensitive conservator valve (If applicable)												
1.42.1	Visual & dimensional work	Measurement	100%	BSPTCL Technical Specification of subject Contract / As per CM data sheet	No damage as per drawing	CM TC	B	K	P	W /Z		N	Record review for first unit of each contract & rest on on survelliance basis.
1.42.2	Oil tightness / leakage test	Measurement	100%	As per manufacturer standard	As per manufacturer standard	CM TC	B	K	P	W /Z		N	DO
1.42.3	Insulation test at 2 kV for 1 minute	Measurement	100%	As per manufacturer standard	As per manufacturer standard	CM TC	B	K	P	W /Z		N	Record review for first unit of each contract & rest on on survelliance basis.
Performance test													
1.42.4	Valve operation test	Measurement	100%	As per manufacturer standard	As per manufacturer standard	CM TC	B	K	P	W /Z		N	DO
1.42.5	Switch operation test	Measurement	100%	As per manufacturer standard	As per manufacturer standard	CM TC	B	K	P	W /Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

		Vendor's Code :-	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
			Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section :In - Process Inspection

S.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	
MAGNETIC CORE													
2.1	Core building												
2.1.1	CRGO sheet selection during core building & assly for testing of stacking factor, Magnetic polarization, specific core loss, Surface insulation resistivity, ductility & aging test during core stacking stage.	Testing	sampling as per CRGO check list	BSPTCL approved check list for inspection / BSPTCL T.S/IEC 60404	BSPTCL approved check list for inspection of PrimeCRGO/ BSPTCL T.S/IEC 60404		D	L	U/V	W/Z		Y	For CRGO during core building as per CRGO check list , Sample to be sent for Testing at third party Lab* / NABL Lab.
2.1.2	Check dimension (diameter, thickness, stack height and verticality) after core building	Visual & measurement	DO	EM Drg. / BSPTCL Spec./ Plant stnd.	EM Drg. / BSPTCL Spec./ Plant stnd.	EMTC	A	J	S	W/Z		Y	Record review for first unit of each contract & rest on on survelliance basis.
2.1.3	Insulation test at 2 KV for 1 minute between core to bolts core to end frame	Testing	DO	EM Specification,Drg & Plant standard/ BSPTCL specn	As per EM Specification,Drg & Plant standard / BSPTCL specn	EMTC	A	J	S	W/Z		Y	DO
2.1.4	Tracebility record of Parent coil	Verification	DO	As per BSPTCL CRGO check list	As per BSPTCL CRGO check list	EMTC	A	J	S	W/Z		Y	DO
2.2 WINDING													
2.2.1	Brazing procedure & . Brazer qualification	Review	100%	EM Specification,Drg & Plant standard IP/2 / .BSPTCL Agreed Brazing procedure	BSPTCL approved Brazers	EMTC	B	K	Q	W/Z		N	Review of BSPTCL approval during BSPTCL inspection
2.2.2	Physical checking of drum label, surface finish, thickness, width of bare conductor & covered thickness of wdg conductor	Measure-ment & Visual	IS 2500 Pt1AQL 4% Inspection level 1 Lot Sample Size Size 2 to 90 5 91 to 280 13	EM Specification,Drg & Plant standard / BSPTCL specn	EM Specification,Drg & Plant standard / BSPTCL specn	EMTC	A	J	S	W/Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

		Vendor's Code :-	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
			Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section :In - Process Inspection

S.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	
2.2.3	Check for Coil Manufacturing. - Mould dia. dressed OD. Wdg direction, lead position, lead length, cross over/ transposition. packing in section. Directed Oil flow, washer position, ID,OD. Lateral Depth of Winding. No. of turns/ sections, lead anchoring, visual check of brazed joints & use of BSPTCL approved qualified brazer/ spacer block arrangements	Measure-ment & Visual	100%	EM Specification,Drg & Plant standard / BSPTCL Spec. and BSPTCL approved brazer qualification	As per EM Specification,Drg & Plant standard / BSPTCL Specification	EMTC	A	J	S	W /Z		N	Record review for first unit of each contract & rest on on surveillance basis.
2.2.4	Check for Pre- shrikange and visual check of brazed joints, vacuum drying, coil pressing (coil clamping) measurement of Coil Depth . mounting of outer barriers	Measure-ment & Visual	100%	EM Specification,Drg & Plant standard / BSPTCL Specification	As per EM Specification,Drg & Plant standard/ BSPTCL Specification	EMTC	A	J	S	W /Z		N	Record review for first unit of each contract & rest on on surveillance basis.
2.2.5	Testing of Winding- Buzzer Test, Measurement of Resistance - (actual test value to be recorded), Megger testing (Isolation test), Sequence test, Ratio test (if reqd.) and circulating current test (if reqd.)	Electrical	100%	.....DO....	.....DO....	EMTC	A	J	S	W /Z		N	DO
2.3	CORE & COIL ASSEMBLY												
2.3.1	check for placement of core	Visual / Physical verification	100%	EM Specification,Drg & Plant standard IP/4 / BSPTCL specn	As per EM Specification,Drg & Plant standard IP/4/ BSPTCL specn	EMTC	A	J	S	W /Z		Y	Record review for first unit of each contract & rest on on surveillance basis.
2.3.2	Check for assembly of bottom insulation on bottom tank & core , lowering of coils on core , proper alignment of blocks , assembly of top insulation , core relacing and tighteninging	Visual / Physical verification	100%	.....DO....	.....DO....	EMTC	A	J	S	W /Z		Y	DO
2.3.3	OLTC assembly (distance between centre line of core to centre line of OLTC),visual checking of crimped joint for soundnessand removing of sharp edge if any,lead position & insulation,electrical clearance between all leads and earth,tightening of electrical connection,check for terminal gear,cleats& cable size & check for covered diameter	Visual / Physical verification	100%	.....DO....	.....DO....	EMTC	A	J	S	W /Z		Y	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section :In - Process Inspection

S.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	
2.3.4	Check for ratio magnetising current test , 2 KV isolation test between core & core clamp	Electrical	100%	.....DO.....	.....DO.....	EMTC	A	J	S/U	W /Z		Y	For one transformer of each rating of each contract.Record review on subsequent units
2.3.5	Dummy insulation block insertion with active part during CCA (detecting moisture content in solid insulation)	Physical test	100%	.....DO.....	Moisture content should be less than 0.5%	EMTC	A/D	J/L	V/U	W /Z		Y	For first unit of each contract of each rating & record review for rest on surveillance basis.(Testing of moisture contents to be carried out at NABL/TPL* lab for first unit of each contract of each rating)
2.3.6	Final inspection of core & coil assy. :- Visual check for completeness cleanliness, Clearances . Absent of sharp edges and placement of component.	Visual	100%	.....DO.....	As per EM Specification,Drg & Plant standard /BSPTCL specn	EMTC	A	J	S/U	W /Z		N	For one transformer of each rating of each contract.Record review on subsequent units
2.4	TREATMENT PROCESS - TANKING AND FINAL PROCESSING INCLUDING VPD												
2.4.1	PREPERATION STAGE PRIOR TO START DRY OUT IN VPD												
2.4.1.1	Tank preparation & cleanliness of tank	Verification	100%	EM Specification & Plant standard	EM Specification & Plant standard	EMTC	A	J	S	W/Z		N	Record review for first unit of each contract & rest on on surveillance basis.
2.4.1.2	Completeness of Core coil Assembly activities	Verification	100%	.....DO.....	.....DO.....	EMTC	A	J	S	W/Z		N	DO
2.4.1.3	Proper fitting of active part in tank	Visual & Measurement	100%	.....DO.....	.....DO.....	EMTC	A	J	S	W/Z		N	DO
2.4.1.4	Clearence of Live parts from tank walls	Visual & Measurement	100%	.....DO.....	.....DO.....	EMTC	A	J	S	W/Z		N	DO
2.4.1.5	Loading of Core coil assembly along with tank in Auto clave /VPD after verification of thermocouple fitting	Visual & Measurement	100%	.....DO.....	.....DO.....	EMTC	A	J	S	W/Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section :In - Process Inspection

S.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	
2.5.2.4.1	Verification of Soaking time as per Voltage requirement	Verification	100%	EM Specification & Plant standard TS 8	EM Specification & Plant standard TS 8	EMTC	A	J	S	W/Z		N	Record review for first unit of each contract & rest on surveillance basis
2.5.2.5	SERVICING												
2.5.2.5.1	Checking for Soaking Servicing & final tanking – Retighten of all screw joints, yoke, bolts pressing of active part, fitting of wall shunt & packing, 2 KV for one minute flash test between core & yoke bolts and end frame & yoke bolts	Verification	100%	EM Specification & Plant standard no TS 7	EM Specification & Plant standard no TS 7	EMTC	A	J	S	W/Z		N	DO
2.5.2.5.2	Exposure Time of active parts	Verification	100%	.....DO....	.....DO....	EMTC	A	J	S	W/Z		N	DO
2.5.2.6	COMPLETE TRANSFORMER ASSEMBLY FOR FINAL TEST												
2.5.2.6.1	Check for completion of assembly for final routine test/type test (as applicable) case fitting, connection of C.T. leads to terminal boards, Bushings fitting, check mounting of cooling equipment & cooling pipe work (for type test unit only)	Visual/ Verification of clearances	100%	EM Specification, Drg & Plant standard TS 5/ BSPTCL appvd OGA Drg	EM Specification, Drg & Plant standard TS 5/ BSPTCL appvd OGA Drg	EMTC	A	J	S	W/Z		N	Record review for first unit of each contract & rest on surveillance basis.
2.5.2.7	TOPPING UP WITH OIL												
2.5.2.7.1	Vacuum achived	Verification	100%	EM Specification & Plant standard TS 5	EM Specification & Plant standard TS 5	EMTC	A	J	S	W/Z		N	DO
2.5.2.7.2	Duration of Vacuum achived	Verification	100%	.....DO....	.....DO....	EMTC	A	J	S	W/Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformer (up to 400 kV)	MQP No. 025	Valid From: 15.01.2016
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section :In - Process Inspection

S.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	
2.5.2.7.3	Final particle count parameters (if applicable)	Electrical	Each Transformer	.....DO....	(<=1000 particles/100ml, size >=5 micron)	EMTC	A	J	S	W/Z		N	DO
2.5.2.7.4	Characteristics of insulating oil after circulation in Transformer and prior to final testing. Electric strength Water content Tan delta at 90° C Resistivity at 90° C IFT at 27° C	Verification	100%	EM Specification & Plant standard / BSPTCL specn	70 kV (Minimum) 5 PPM (Max.) 0.005 (Max.) 10x10 ¹² ohm-cm (Minimum) 0.035 N/m (Minimum)	EMTC	A	J	S	W/Z		N	Oil to be used for impregnation,testing & for final filling at site should be same make/ grade meeting BSPTCL spec.
2.5.2.8	SETTLING TIME BEFORE START OF HIGH VOLTAGE TEST	Verification	100%	EM Specification & Plant standard	24 hrs, minimum	EMTC	A	J	S	W/Z		N	DO



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

Vendor's Code :-	Item: Power Transformers	MQP No. 025	Valid From: 15.01.2016
	Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section :Final Inspection Test

S.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
							A	J	S	W	E	N	
3	COMPLETE TRANSFORMER ASSY. FOR FINAL TEST												
3.1	Check for completion of assy. for final routine test / type test (as applicable) Transformer offered for routine test Connection of CT to terminal boards, Records serial no. of bushings. Phase marking, Earthing of core with Tank ,as per BSPTCL approved drawing , check for cleanliness of complete Transformer (Transformer to be free from oil seepage) Transformer offered for Type test in addition to routine test requirement check completion of all external fittings eg. Cooler equipment cooling pipe work as per BSPTCL approved drawing.	visual & Measurement	100%	EM mfg, Drg. / BSPTCL approved OGA drg. / BSPTCL Technical Specification of Subject Contract	EM mfg, Drg. / BSPTCL approved OGA drg. / BSPTCL Technical Specification of Subject Contract	EMTC	A	J	S	W	E	N	Review of EM record Surveillance check
ROUTINE TESTS : All routine test mentioned in applicable Technical Specification of subject contract in question need to be carried out, (Transformer shall be offered for routine test witnessing only after completion of oil filtration & settling)													
3.2.1	Apperance , construction & dimension check	Measure-ment & Visual	Each Transformer	BSPTCL Spec. BSPTCL Appd. Drg./ BSPTCL Appd. Tech. Data Sht. And BSPTCL agreed Painting procedure	BSPTCL Spec. BSPTCL Appd. Drg./ BSPTCL Appd. Tech. Data Sht. And BSPTCL agreed Painting procedure	EMTC	A	J	U	W		Y	
3.2.2	Measurement of Winding resistance.	Electrical	Each Transformer	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	EMTC	A	J	U	W		Y	
3.2.3	Measurement of insulation resistance & PI value	Electrical	Each Transformer	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	(PI value) (HV+IV+N)/LV+E ≥ 1.5 LV/(HV+IV+N+E) ≥ 1.5 (HV+IV+N)/LV ≥ 2.0 IR value : For all above combinations shall be ≥ 1Gohm at 60 sec.	EMTC	A	J	U	W		Y	
3.2.4	Measurement of voltage ratio	Electrical	Each Transformer	.....DO.....	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	EMTC	A	J	U	W		Y	
3.2.5	Polarity test & Vector group test	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A	J	U	W		Y	
3.2.6	No load loss & current measurement	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A	J	U	W		Y	



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

Vendor's Code :-	Item: Power Transformers	MQP No. 025	Valid From: 15.01.2016
	Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision

Section :Final Inspection Test

S.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
							A	J	U	W	Z	Y	
3.2.7	impedance voltage and load loss measurement	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A	J	U	W	Z	Y	
3.2.8	Measurement of insulation power factor and capacitance between winding & earth	Electrical	Each Transformer	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	Max. Tan delta value at ambient temp (HV+IV+N)/LV (CHL): < 0.4% (HV+IV+N)/LV+E (CHL+CHG)< 0.4% LV/(HV+IV+N+E) (CHL+CLG): < 0.4% IR value for all above combination shall be greater than 1 G ohm at 60 seconds.	EMTC	A	J	U	W	Z	Y	
3.2.9	Measurement of insulation power factor and capacitance of Bushing	Electrical	Each Transformer	.....DO.....	Tandelta value of all type of bushings should be< 0.4% at ambient temp.	EMTC	A	J	U	W	Z	Y	
3.2.10	Lightning Impluse test	Electrical	Each Transformer	.....DO.....	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	EMTC	A	J	U	W	Z	Y	
3.2.11	Measurement of transferred surge on LV (tertiary) due to HV lightning impluse and IV lightning impluse as applicable	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A	J	U	W	Z	Y	
3.2.12	Switching Impluse test	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A	J	U	W	Z	Y	
3.2.13	Separate source voltage withstand test (Applied voltage withstand test)	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A	J	U	W	Z	Y	
3.2.14	Induced over voltage withstand test with PD measurement (IVPD / LTAC / IVW to be done as per TS of subject contract)	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A	J	U	W	Z	Y	
3.2.15	Repeat no load loss test after dielectric test	Electrical	Each Transformer	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	EMTC	A	J	U	W	Z	Y	
3.2.16	Test on OLTC - (Ten complete cycle before LV test) and other tests such as One complete operating cycle at 85 % of auxillary supply voltage ,one complete operating cycle with Transformer energised at rated voltage and frequency at no load .Ten tap change operation with + / - 2 steps of principal tap with as far as possible the rated current of Transformer with one winding short circuited etc as per IS 2026	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A	J	U	W	Z	Y	



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

	Vendor's Code :-	Item: Power Transformers	MQP No. 025	Valid From: 15.01.2016				
		Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision				
Section :Final Inspection Test								
S.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
3.2.17	DGA test before & after final electrical test	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A J U W / Z	Y
3.2.18	Core assembly dielectric & earthing continuity test (CC-CL; CC-Tank & CL to tank)	Electrical	Each Transformer	.....DO.....	Acceptance value with 2 KV Megger for isolation test shall be 1.0 G-ohm (min)	EMTC	A J U W / Z	Y
3.2.19	Short duration heat run test (Not applicable for unit on which temp rise test is performed)	Electrical	Each Transformer (except type tested unit)	.....DO.....	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	EMTC	A J U W / Z	Y
3.2.20	Over excitation test @ 110% voltage for 2 hrs.	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A J U W / Z	Y
3.2.21	Magnetic Balance Test (for 3-ph transformer only)	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A J U W / Z	Y
3.2.22	Measurement of no load current and short ckt impedance with 415 V, 50 Hz AC supply	Electrical	Each Transformer	.....DO.....	.....DO.....	EMTC	A J U W / Z	Y
3.2.23	Frequency Repose Test (FRA) after completion of all electrical Test for normal, first & extreme taps. Soft copy to be submitted for BSPTCL record.	Electrical	Each Transformer	BSPTCL Spec. BSPTCL Agreed FRA test procedure.	BSPTCL Spec. BSPTCL Agreed FRA test procedure.	EMTC	A J U W / Z	Y
3.2.24	High Voltage withstand test on auxillary equipment & wiring after assembly	Electrical	Each Transformer	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	BSPTCL Spec. BSPTCL Appd. Tech. Data Sheet/ IEC:60076	EMTC	A J U W / Z	Y
3.2.25	Jacking test & DP check of jacking pads welds after jacking	Mechanical	Each Transformer	.....DO.....	.....DO.....	EMTC	A J S W / Z	Y Record review for first unit of each contract & rest on surveillance basis.
3.2.26	Oil leakage test on tank with turrets and all other accessories as assembled for routine test. - Conservator and PRV not to be mounted, and to be tested separately. Turrets to be blanked with suitable flanges after dismantling bushing.	Mechanical	Each Transformer	.....DO.....	.....DO.....	EMTC	A J U W / Z	Y
TYPE TEST -- All type test required as per TS of the subject contract in question need to be conducted								Approval from BSPTCL Engineering to be obtained
4.0	PACKING AND DESPATCH -							
4.1	Dew point measurement of nitrogen/ dry air before filling on Transformer	On sample basis	On sample	BSPTCL applicable TS of subject contract	Better than (-) 60 deg. C	EMTC	A J S W / Z	N Record review on surveillance basis.



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- POWER TRANSFORMERS (Upto 400 kV Class)

		Vendor's Code :-	Item: Power Transformers	MQP No. 025	Valid From: 15.01.2016							
			Date - 04.01.2016	Rev. No.-00	Valid Upto: Till Revision							
Section :Final Inspection Test												
S.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	
4.2	Pre-shipment check-Nitrogen gas/Dry air tightness, proper blanking of all openings, mounting of Nitrogen gas cylinder & regularization of pressure	Visual	Each Transformer	BSPTCL Specn/ EM Spec.	Pressure to be maintained at 5 psi (+/-1 for 24 hrs.	EMTC	A	J	S	W / Z	N	Record review on surveillance basis.
4.3	Dew point measurement of nitrogen/air after 24 hrs of filling in Transformer	Testing	Each Transformer	.....DO.....	(Dew point value after 24 hrs) -38 at 20degree -35 at 30 degree -30 at 40 degree	EMTC	A	J	U	W / Z	Y	
4.4	Visual check of paint shade, paint film thickness- film adhesion test and Record review of Previous stages	Visual & Measurement	Each Transformer	.....DO.....	As per EM Specn & Plant stdn / BSPTCL spec./ BSPTCL agreed painting procedure	EMTC	A	J	U	W / Z	Y	
4.5	Verification of completeness of accessories & Check for soundness of packing of accessories and fittings	Visual	Each Transformer	EM Shipping List	EM Shipping List	EMTC	A	J	S	W / Z	N	Record review on surveillance basis.
4.6	Installation of Electronic impact Recorder and GPS on hydraulic Trailer	Visual	Each Transformer	As per BSPTCL contract	As per BSPTCL Specn/ EM Spec.	EMTC	A	J	S	W / Z	N	Ensure to install new battery in the impact recorder before despatch
4.7	Verification of Dispatch Instructions/ Clearance reference on packing cases	Verification	Each Transformer	Dispatch Instructions/ Clearance issued by BSPTCL	Dispatch Instructions/ Clearance issued by BSPTCL	EMTC	A	J	S	W / Z	N	Record review on surveillance basis.