M/S. GETCO

BHARAT HEAVY ELECTRICALS LIMITED, JHANSI

BHEL/CQX/007/0006	QUALITY ASSURANCE PLAN FOR CUSTOMER :- M/s GETCO LOI REF: ACE(PROC)/IIE-272C/EHV XMER/LOI/BHEL JHANSI/2270 DTD.19/02/2020	QUALITY ASSURANCE PLAN FOR POWER TRANSFORMER . WO. NO. 72586A17100, 1Sx160 MVA, 220/66 kV Power Trnsfr WO. NO. 72587A17200, 1x150 MVA, 220/132 kV Auto Trnsfr WO. NO. 72588A17100, 06x125 MVA, 220/33 kV Power Trnsfr	MATERIAL INSPECTION/IN-PROCESS INSPECTION/ FINAL INSPECTION	SUB VENDORS/ VENDORS/ CONTRACTORS WORK	QP No: QP-T-13x1 Rev. No. 00 Date: 11/03/2020 Page: 5 of 14

S No.	Components & operations	Characteristics	Sampling	Reference/ Standard	Acceptance norms	Applicable codes M	C	N	Remarks
		9. Aging in oil-finish, flexibility & change			9. As per standard				
		10. PH value			10. 5-8.5				
9.	Condenser bushing (RIP)	1. Measurement of dielectric dissipation factor & capacitance	100%	IEC 60137	1. ≤0.4	P	P	V	
		2. Dry power frequency voltage withstand test			2. As per standard/ approved GTP	P	V	V	
		3. Measurement of partial discharge			3. As per standard/ approved GTP	P	V	V	
		4. Pressure test			4. As per standard/ approved GTP	P	V	V	
		5.Creepage distance			5. As per standard/approved GTP	P	V	V	
		6. Visual & dimensional			6. As per approved drawing	P	V	V	
		7.Insulation resistance Measurement test			7. As per standard/approved GTP	P	V	V	
		8. HV test			8. As per standard/approved GTP	P	V	V	
10.	Buchholz relay	1. Type & make	100%	IS 3637	1. As per approved drawing	P	V	V	
		2. Porosity			2. As per standard				
		3. High voltage			3. As per standard				
		4. Insulation resistance			4. As per standard				
		5. Element test			5. As per standard				
		6. Gas volume test			6. As per standard				
		7. Loss of oil & surge test			7. As per standard				
11.	Bimetallic terminal connector	1. Dimensional	100%	IS 5561	1. As per approved drawing				
		2. Visual check			2. Free from defect				
		3. Tensile strength			3. As per test report				
		4. Resistance			4. As per test report				
12.	Marshalling box	1. Dimension & visual check	100%	Approved drawing & specification	1. As per approved drawing	P	V	V	
		2. 2kV test for auxiliary wiring			2. 1 min. withstand				
		3. Paint shade & thickness			3. As per approved drawing				
		4. Wiring routine check			4. Firm & aesthetic				
		5. Functional check			5. As per approved drawing				
13.	Remote tap changer control cabinet	1. Dimensional & visual check	100%	Approved drawing & specification	1. As per approved drawing	P	V	V	
		2. 2k test for Auxiliary wiring			2. 1 min. withstand				
		3. Paint shade & thickness			3. As per approved drawing				
		4. Wiring routing check			4. Firm & aesthetic				

Degree of Protection class

GETCO
ENGG. DEPT.
M.O.F. APPROVAL
Particular Sign.
Approved w/o Comment
Approved with Comment
Approved for Information
Not Approved

Legends: M- Manufacturer, C-Contractor, N- Customer, P- Performer, V- Verification, W- Witness

(सत्येन्द्र कुमार वर्मा)
(SATYENDRA KUMAR VERMA)
उप प्रबन्धक (कैप्टिव गुणता सेवायें)
Dy. Manager (CQX)
बी०एच०ई०एल०, झाँसी
B.H.E.L., JHANSI

B.H.E.L. VADODARA

(हरेन्द्र सिंह)
(HARENDRA SINGH)
Chief Manager (कैप्टिव गुणता)
Manager (CQX)
बी०एच०ई०एल०, झाँसी
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M/s PGCIL Quality Plan

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पावर ग्रिड कारपोरेशन ऑफ इंडिया लिमिटेड
(भारत सरकार का उद्यम)

POWER GRID CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

पावरग्रिड

केन्द्रीय कार्यालय : "सौदामिनी" प्लॉट सं. 2, सैक्टर-29, गुडगाँव-122 001, हरियाणा
फोन : 2571700 - 719, फैक्स : 2571760, 2571761 तार 'नेटग्रिड'
Corporate Office : "Saudamini" Plot No. 2, Sector-29, Gurgaon-122 001, Haryana
Tel. : 2571700 - 719, Fax : 2571760, 2571761 Gram : 'NATGRID'

Annex-A for Grade-C

Item	Existing CIP requirement	New CIP requirement
PICC/ CTC	As per existing requirement of MQP (CIP in Level-IV for 1 sample of each size for first 3 transformers of each contract for each sub vendor. CIP in level 2 for rest of the units)	CIP in Level-IV for 1 sample of each size for 01 transformer of each contract for each sub vendor. Balance record review
Prime CRGO	As per existing requirement of MQP (CIP in Level-IV for Each Job)	No change
CRGO Lamination	As per existing requirement of MQP (CIP in Level-IV for Each Job)	No change
OIP Bushing	As per existing requirement of MQP **Imported bushings** - CIP in Level-IV for complete set of bushing of 01 Transformer/Reactor of each contract. Balance record review. **Indigenous bushing**- CIP in Level-IV for all bushing including spare bushings in case of indigenous	CIP in Level-IV for complete set of bushing of 01 Transformer /Reactor of each contract in case of both indigeneous and imported. Balance record review.
RIP Bushing	As per existing requirement of Bushing Mfr's MQP	No change
OLTC	As per existing requirement of MQP (CIP - for one unit of each type & size of each contract. Record review on surveillance basis for rest of the units)	No change
Tank	As per existing requirement of MQP (CIP in Level-IV for one transformer for each contract. Balance CIP level II)	No change
Radiators & pipe asmbly.	As per existing requirement of MQP (CIP level- IV for one transformer for each contract. Balance record review on surveillance basis)	No change
Core Building	As per existing requirement of MQP (CIP in Level-IV for Each Job)	No Change
Winding	NA	CIP in Level IV for one unit per package. For balance recored review. (Visual and dimensional checks as per Mfr's Plant standard before Coil stablization)
CCA	CIP in Level-IV on all transformer of each rating of each contract	No Change
Oil Parameter before start of FAT	NA	CIP in Level-IV for one transformer for each contract. Balance CIP level II
Servicing and Tanking*	NA	CIP in Level II for each unit. (To check visual inspection of CCA after VPD and internal cleanliness of Tank before tanking.)
Internal Inspection before dispatch	Joint internal inspection for all unit before final dispatch.	CIP in Level-IV on all transformer of each rating of each contract

***Process should not be delayed on account of inspection**

पंजीकृत कार्यालय : बी-9, कुतब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली - 110016 दूरभाष : 6560121 फैक्स : 011-6560039 तार : 'नेटग्रिड'
Registered Office : B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi - 110016 Tel. : 6560121 Fax : 011-6560039 Gram : 'NATGRID'

M/S PGCIL Quality Plan

Standard Manufacturing Quality Plan- Power Transformer (Upto 245 kV Class)

BHEL, Jhansi	Customer : POWERGRID	Vendor Code 24427C	Power Trfr up to 220KV class	MQP No.: TXB 121	Rev. No. P4	Rev. Date 03.06.2015	Valid from 04.06.15	Valid up to 03.06.16	Page
Sl no	Details of change in item		Rev P3 (earlier approved)		P4 (Proposed for approval)	Details of changes			
1.6.3	Moulded Components (if applicable/ required)		Nil		New requirement added by Power Grid	Newly added as per standard MQP of Power Transformers			
1.11 (B)	RIP Bushings (If applicable)		Nil		New requirement added by Power Grid	Relevant tests added as per POWERGRID TS requirement			
1.17	MrBox / Control cabinet		Only survillance check		CIP added at the time of final testing of Trfr at EM works	New CIP added as per standard MQP			
1.25 8.2	Air pressure test on pipe work & header assembly for radiator		Record review on surveillance basis		CIP stage added for 1st Transformer unit	Newly added as per standard MQP of Power Transformers			
1.30	RTCC (for power transformers) / Digital RTCC Panel (tan changer control & Transformer monitoring system for power transformers) as applicable		Nil		New requirement (Digital RTCC panel/AVR) added by Power Grid	Newly added as per POWERGRID TS requirement			
1.36.2	Online Dissolved gases & Moisture Monitor (if applicable)		Hidrogen gas sensor		Multi gas sensor & New requirement added by Power Grid	Updated as per POWERGRID TS requirement & Record review for first unit added			
1.39	Flow sensitive conservator valve		Nil		New item added by Power Grid	Newly added			
2.3.3	Core & Coil assembly		No CIP stage		CIP stage addedby Powergrid	CIP stage added for 1st unit			
2.4.2.7.3	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		Nil		New note added	Same oil to be used for impregnation as for filling at site			
3.1.8	Measurement of insulation power factor and capacitance between winding & earth during final routine tests		Max Tan delta value at ambient temp (HV+IV+N)/LV (CHL):0.5% (HV+IV+N)/LV+E (CHL+CHG): 0.5% LV/(HV+IV+N+E) (CHL+CLG): 0.5%		Tan delta value at ambient temp less than 0.4 %for all combination (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%	Tan delta vlues changed as per standard MQP of Power Transformers			
4.6	Electronic impact Recorder & GPS system on hydraulic trailers		Installation of Electronic impact Recorder		Installation of Electtonic impact Recorder & GPS system on hydraulic trailers	GPS system on hydraulic trailers newly added			
	DC Gupta, Sr DGM (COx& Test), BHEL Jhansi								

DC Gupta, Sr DGM(COx& Test), BHEL Jhansi

Approved by POWERGRID

M/s PGCIL Quality Plan

Standard Manufacturing Quality Plan- Power Transformer (Upto 220 kV Class)

QAP No. :TXB 121 - ,Rev:P4

Notes and codes

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

NOTES:-

1	This MQP shall be read in conjunction with POWERGRID specification and shall deem to include additional test, if any, required as per the contract.
2	POWERGRID specification shall include provisions of Letter of Award (LOA), POWERGRID approved – drawings / technical data sheet / Bill of Material (BOM) /test procedure applicable to the specific contract.

M/s PGCIL Quality Plan

3	In case of any contradiction between BHEL's plant standards, this MQP and POWERGRID specification, following precedence shall be followed. a). POWERGRID Specs. b). This MQP c). Manufacturers plant standards
4	Where Indian /International Technical Standard are referred, their last amendments shall be included. The same is applicable in case of BHEL specification also, so long as these changes are made with the approval of competent authority of BHEL.
5	It is responsibility of BHEL to ensure that this document is readily available at their works, as well as the works of their sub-vendors in order to avoid any delay at the time of inspection.
6	BHEL & BHEL's sub-vendor shall ensure that control, Metering and Testing instruments are duly calibrated and should have calibration certificates traceable to Indian/ International Standards. Calibration records shall be available during inspection by POWERGRID. Key instruments shall be calibrated only by NABL accredited laboratories.
7	In case of any tests being carried out at the third party lab, such lab/ facility shall be NABL accredited/approved by POWERGRID.
8	All raw material / bought-out items for which approval has been envisaged shall be procured from POWERGRID approved sub-vendors only.
9	Co-related supplier TC for items (for other then stock item & raw material) with unique sl. no. shall be maintain by BHEL for verification by PGCIL.
10	Inspection of spare items ordered by POWERGRID shall also be governed by the provisions of this MQP. Items if not covered under this MQP shall be offered for inspection as per POWERGRID approved specification and drawing / relevant Indian/ International Standards.
11	Any material rejected during POWERGRID inspection shall be disposed off with intimation to POWERGRID. For destructive disposal POWERGRID may depute its representative for witnessing. In case the material is to be returned to sub-vendor, all such items shall be indelibly identified (to prevent mixing) at the works of BHEL and offered to POWERGRID for verification of marking.
12	POWERGRID agreed Welding Procedure specification, Brazing Procedure specification, FRA Test procedure (wherever applicable) and Painting Procedure
13	This MQP is standard MQP for Power Transformer up to 220 KV to be manufactured at the works of BHEL, Jhansi as per the POWERGRID Spec. . In case of any amendment/new specification which necessitate MQP revision shall be notified and MQP shall be amended accordingly with mutual agreement of POWERGRID and BHEL
14	All the packing cases shall be marked with POWERGRID LOA details, name of project, item description and CIP / MICC number by which material has been cleared for dispatch., one copy of CIP/ MICC shall be sent along with consignment.
15	BHEL shall align Quality system of their sub-vendor to the requirement of latest series of ISO : 9000 quality standards in a time bound manner.
16	Any additional/Change in new sub-vendor / Process shall call for review by POWERGRID for MQP amendment if necessary.
17	Powergrid may review effective implementation of the process through period audit during the Product / Process inspection. In case of notice of discrepancy w. r. t. process / process parameter, the reason along with corrective & preventive measures shall be conveyed to Powergrid by Process Owner with in 2 weeks.
18	POWERGRID Specn is General Technical specification of POWERGRID contracts.
19	BHEL shall show the approval of POWERGRID engineering for all contract specific type test, including specific type tests if any as per the POWERGRID specifications at the time of final inspection.

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Standard Manufacturing Quality Plan - Power Transformer (Upto 220 kV Class)

BHEL Jhansi	Customer : POWERGRID	Vender Code 24427C	Power Transformer	MQP No.: TXB 121	Rev. No. P4	Rev. Date 03.06.15	Valid from 04.06.15	Valid up to 03.06.16	Page

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 1	2	3	4	5	6	Remarks
1.11 (A)	CONDENSER BUSHING										E		
1.11.1	Test on bushing of 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	Powergrid Approved MQP of condensor bushing manufacturer	Acceptance criteria : 1.) 70 kV (min) 2.) 10ppm (max) 3.) $10x10^{12}$ ohm-cm (min) 4) 0.008 (max) 5) 40 mN/m (min)	CMTC	B/C	K/L	U/V	W/Z	Y		CIP in case of indigeneous (all tests to be carried out either at bushing manufacturer's works or at 3rd party NABL lab) In case of imported bushings. Record reviews during bushing inspection
1.11.2	Visual check, fitting of all accessories, & type	Visual	100%	Powergrid apprd. Drg & Tech. Data sheet , Powergrid approved MQP for condensor bushing / Powergrid Spec.	Powergrid apprd. Drg & Tech. Data sheet , Powergrid approved MQP for condensor bushing / Powergrid Spec.	CMTC	B	K	U	W/Z	Y		CIP for all bushing including spare bushings in case of indigeneous CIP for complete set of bushings of one Transformer of each contract for imported bushings balance record review
1.11.3	Routine test measurement of tan delta & capacitance at ambient temp, Dry, P. f. voltage with stand test, Measurement of p.d, quantity, lightning impulse with stand (for all 420 KV bushings), Test tap insulation test & pressure test for leakage of internal filling as specified in IEC 60137	Electrical	100%	IEC 60137 / Powergrid apprd. Drg & Tech. Data sheet , Powergrid approved MQP of condensor bushing manufacturer / Powergrid Spec.	IEC 60137 / Powergrid apprd. Drg & Tech. Data sheet , Powergrid approved MQP of condensor bushing manufacturer / Powergrid Spec. Tandelta value of all type of bushings should be less than 0.4% at ambient temp.	CMTC	B	K	U	W/Z	Y		..... DO.....
1.11.4	TYPE TEST : All type test required as per TS of the subject contract in question need to be conducted / approval from Powergrid Engineering to be obtained												

MIS PGCIL Quality Plan

Standard Manufacturing Quality Plan- Power Transformer (Upto 220 kV Class)

BHEL, Jhansi	Customer : POWERGRID	Vender Code 24427C	Power Transformer	MQP No.: TXB 121	Rev. No. P4	Rev. Date 03.06.15	Valid from 04.06.15	Valid up to 03.06.16	Page

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 1	2	3	4	5	6	Remarks
1.11 (B)	RIP Bushing (if applicable)	All routine test as per Powergrid approved MQP of RIP bushing manufacturer, IEC 60137/Power Grid Specification and test on silicone insulator as per IEC 61462/62217									E		CIP
	All Type tests required as per the contract in question need to be conducted / approval to be obtained from PGCIL Engg.												Approval from PGCIL Engg. Required
1.12	Porcelain Bushing												
1.12.1	Visual check & dimensional check	Measure-ment & Visual	100%	IS 2603 / IS3347/ IS 2099 & Powergrid specn.	No surface defects & dimensions with in tolerance	CMTC	A/E	J/K	S/P	W		N	Record review for first unit of each contract & rest on surveillance basis.
1.12.2	All Routine test including Power frequency voltage withstand test as per IS 2099	Electrical	100%	DO	As per IS 2603 / IS3347/ IS 2099 & Powergrid specn.	CMTC	B	K	P	W		N	DO
1.12.3	TYPE TEST : All type test required as per TS of the subject contract in question need to be conducted / approval from Powergrid Engineering to be obtained												
1.13	CURRENT TRANSFORMER										E		
1.13.1	Visual check, check for dimensions (ID, OD, thickness) & completeness	Measurement & Visual.	100% (10% dimension check)	IS 2705 / Powergrid Specification	No surface defects & dimensions with in tolerance	CMTC	A/E	J/K	S/P	W		N	Record review for first unit of each contract & rest on surveillance basis.
1.13.2	Accuracy, Ratio, Power frequency dry withstand test on secondary, over voltage inter tum, Verification of terminal marking & polarity, knee point voltage & exciting current test for P.S class CT Secondary wdg. Resistance for PS class CT	Electrical	100%	DO	As per IS 2705 / IEC 60044/ Powergrid Specification	CMTC	B	K	P	W/Z		N	DO
1.14	SECONDARY TERMINAL BOARD										N		
1.14.1	Visual check	Visual	100% by Com Mfr, IS-2500 Part-I AQL 4% Inspection level 1 Lot Size 2 to 90 Sample size 5	BHEL Drg./ Powergrid specn.	No surface defects	CMTC	A/E	J/K	S/P	W		N	Record review for first unit of each contract & rest on surveillance basis.