

 एस् एन डी एल लिमिटेड	PROJECT: ARUN 3 HEP (4×225 MW)		MANUFACTURING QUALITY ASSURANCE PLAN				MANUFACTURER: Bharat Heavy Electricals Limited, Bhopal			
	ITEM DESCRIPTION		SUB-ITEM		QAP & REV	ISSUE DATE				
	GENERATOR & AUXILIARIES		Top & Bottom Shaft		QA/HG/561 Rev -04	06.12.2019				
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
					M/C S				M C S	
1	2	3	4	5	6	7	8	9	10	11

E. SHAFT (DE-Bottom shaft & NDE-Top shaft)										
1.	Forging for shaft									
1.1	Chemical Analysis (Melt Analysis)	MA	Test	Sample	Sample	Relevant material standard as per drawing	TC	P	V	V
1.2	Mechanical properties UTS, YS, % elongation, % reduction in area, Impact test.	MA	Test	Sample	Sample		TC	P	V	V
1.3	NDT (Preliminary)	MA	NDT	100%	100%		-do-	P	V	V
1.4	Heat Treatment	MN	Review	100%	100%		Chart	P	V	V
1.5	Hardness test after heat treatment	MA	Test	Sample	Sample	-do-	-do-	TC	P	V
2.	In-process inspection									
2.1	Visual Check, Boroscopic examination of shaft	MA	Vis	100%	100%	Drawing	IR	P	W	V
2.2	NDT (final NDT of rough machined forging)	MA	NDT	100%	100%	Drawing	IR	P	W	V
3.	Final Inspection									
3.1	Final dimensions, run out, concavity-convexity	MA	ME/Vis	100%	100%	Drawing	IR	P	W	W
3.2	Measurement of roughness of thrust collar surface (for bottom shaft) & other super finished surfaces.	MA	Vis	100%	100%	-do-	IR	P	W	W
3.3	NDT of Machined surface (UT & DPT)	MA	NDT	100%		-do-	IR	P	W	W
3.4	MPI on transition areas	MA	NDT	100%		-do-	IR	P	W	W
3.5	Check for surface protection	MN	Vis	100%	100%	-do-	TC	P	W	W
3.6	Assembly of generator & turbine shaft	Covered under MQAP for turbine.								
4.1	Tubular Shaft - Visual, Dimensional & surface finish check	MA	ME/Vis	100%	100%	Drawing	IR	P	W	V
5	Assembly of DE (bottom shaft) shaft with rotor spider and NDE (top shaft) shaft with	MA	Vis	100%	100%	Drawing	IR	P	W	W

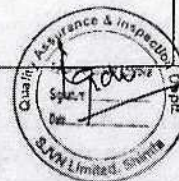
Prepared By:
 AADHAR SHARMA
 Sr. Engineer (QMT)
 Quality Control/WTM
 (Page 10 of 18)
 वरिष्ठ अभियंता
 गुणता नियंत्रण-खंड
 बी.एस.ई.एल. भोपाल / डी.एल.सी

Reviewed By:
 G. S. Bhatnagar
 Sr. Engineer (QMT)
 Quality Control/WTM

Approved By:

Process Owner

SUN Area - Power Development Company (P) Ltd.			
To be issued to Contractor			
Company APPROVAL WITH COMMENTS			
Approved by	Reviewed	Recommended	Approved
Signature	Signature	Signature	Signature
Offer Date	Reviewed	Recommended	Approved



	PROJECT: ARUN 3 HEP (4×225 MW)		MANUFACTURING QUALITY ASSURANCE PLAN				MANUFACTURER: Bharat Heavy Electricals Limited, Bhopal			
	ITEM DESCRIPTION		SUB-ITEM		QAP & REV	ISSUE DATE				
	GENERATOR & AUXILIARIES		Instruments & Testing Equipment		QA/HG/561 Rev -04	06.12.2019				
SR. NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
					M/C S				M C S	
1	2	3	4	5	6	7	8	9	10	11

2.	Communication check between various sub-system.	MA	Test	100%	100%	Data Sheet/Drg /relevant standard	TC	P	V	V	
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LEGENDS					
C	CONTRACTOR (BHEL)	IR	INSPECTION REPORT	P	PERFORM
CHP	CUSTOMER HOLD POINT	M	MANUFACTURER	S	SAPDC LTD.
CR	CRITICAL	MA	MAJOR	TC	TEST CERTIFICATE
DRG	DRAWING	ME	MEASUREMENT	V	VERIFICATION OF RECORDS
ET	ELECTRICAL TEST	MN	MINOR	Vis	VISUAL CHECK
HT	HEAT TREATMENT	NDT	NON DESTRUCTIVE TESTING	W	WITNESS
NOTE: QAP SHALL BE READ IN CONJUNCTION WITH QUALITY ASSURANCE REQUIREMENT GIVEN AS PART OF TECHNICAL SPECIFICATION.					
MANUFACTURER / SUB-CONTRACTOR:		CONTRACTOR:		FOR SAPDC USE:	REFERENCE DOC NO. OF SJVN:
PREPARED BY:	REVIEWED BY	REVIEWED & RECOMMENDED BY	REVIEWED BY	RECOMMENDED BY	APPROVED BY
NAME & SIGNATURE	NAME & SIGNATURE	NAME & SIGNATURE	NAME & SIGNATURE	NAME & SIGNATURE	SIGNATURE & SEAL

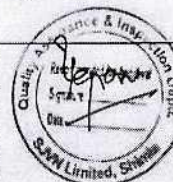
Note:

1. BHEL shall submit copy of all the internal reports/ TCs/ MTCs for review and record of SAPDC
2. Material of construction / methodology of construction shall be as per technical specification / approved drawing
3. Mechanical properties, if not covered above, but required to be conducted as per relevant material standard; same shall be conducted by BHEL

Prepared By: Arun SHARMA Sr. Engineer (QM) Quality Control-WTM	Reviewed By: Rajat Sharma Manager	Approved By: Process Owner
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APN Arun- Power Development Company (P) Ltd.			
To be issued to Customer			
Category: APPROVAL AND COMPLIANCE			
Approved by	Checked by	Reviewed by	Approved by
Other Use	Not used	Recommended	Approved



13/12/19
Rajat Sharma
Manager



QUALITY ASSURANCE DEPARTMENT

QA PLAN FOR: FORGINGS
QA PLAN NO: QSP/HG/104

DATE: 13/10/1993

PI NO: _____
REVISION: 01

SHEET 1 of 2
DATE: 14/01/2016

SL. NO.	COMPONENT/ASSY/ OPERATION	CHARACTERISTICS	CLASS	TYPE	QUANTUM OF CHECK	REF. DOC.	RECORD FORMAT	INSPECTION AGENCY	REMARKS
1.0	Forging stock (ingot or bloom)	a) Material certification	Major	Review	100%	Spec/ Drawing	TC	Supplier/BHEL/ Customer	
		b) Material identification	Major	Review	100%	Spec/ Drawing	TC	Supplier/BHEL/ Customer	
1.2	Forging	a) Visual and process checks	Major	Review	100%	Approved forging process	Supplier QC record	Supplier/BHEL/ Customer	
		b) Heat treatment	Critical	Heat treatment	100%	Spec	TC	Supplier/BHEL/ Customer	
		c) Marking of test samples as per drawing	Major	Review	100%	Drawing	Supplier QC record	Supplier/BHEL/ Customer	
		d) Chemical analysis	Major	Chem	Sample	Spec	TC	Supplier/BHEL/ Customer	
		e) Mechanical analysis	Major	Mech	Sample	Spec	TC	Supplier/BHEL/ Customer	
		f) Ensure proof marking for availability of machining allowance	Major	Dimensional	100%	Drawing	Supplier QC record	Supplier/BHEL/ Customer	
		g) Marking of PF nos., etc. before rough machining	Major	Review	100%	Drawing	Supplier QC record	Supplier/BHEL/ Customer	
		h) Visual & dimensional checks of rough machined forgings	Major	Visual/ Dimensional	100%	Drawing	Supplier QC record	Supplier/BHEL/ Customer	

PREPARED BY: -SD-

CHECKED BY: -SD-

APPROVED BY: -SD-

DATE: 13/10/1993

REVISION 01: 1) "Important note" has been added. 2) The "Type" field was blank for 1.2 c) & 1.2 g). 3) The "Record format" field was blank for Sl. No. 1.2 c). 4) The format has been updated.

PREPARED BY: *[Signature]* 14/01/2016

CHECKED BY: *[Signature]* 14/01/16

APPROVED BY: *[Signature]* 15/01/2016

DATE: 14/01/2016

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QUALITY ASSURANCE DEPARTMENT

QA PLAN FOR: FORGINGS
QA PLAN NO: QSP/HG/104

DATE: 13/10/1993

PI NO: _____
REVISION: 01SHEET 1 of 2
DATE: 14/01/2016

SL. NO.	COMPONENT/ASSY/ OPERATION	CHARACTERISTICS	CLASS	TYPE	QUANTUM OF CHECK	REF. DOC.	RECORD FORMAT	INSPECTION AGENCY	REMARKS
		i) UT on forging and boroscopic examination	Major	NDT	100%	Drawing	TC	Supplier/BHEL/ Customer	
		j) Final marking of PF nos., heat nos., identification, etc.	Major	Review	100%	Drawing	TC	Supplier/BHEL/ Customer	
		k) Painting, preservation, and packing	Major	Review	100%	Drawing	TC	Supplier/BHEL/ Customer	

ABBREVIATIONS: NDT - Non Destructive Testing, Mech - Mechanical, Chem - Chemical, Elec - Electrical, Spec - Specification, TC - Test Certificate, QC - Quality Control

IMPORTANT NOTE: Some of the above-mentioned tests may be witnessed by the customer. This shall be intimated at a later date.

PREPARED BY: -SD-

CHECKED BY: -SD-

APPROVED BY: -SD-

DATE: 13/10/1993

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PREPARED BY: *Krishna C Bandaru* 14/01/2016CHECKED BY: *Ritesh Gajbhiye* 14/01/2016APPROVED BY: *Krishna C Bandaru*

DATE: 14/01/2016

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