



NUCLEAR POWER CORPORATION OF INDIA LTD.,
(A Government of India Enterprise)

SPECIFICATION NO. : PC - M - 971

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TECHNICAL SPECIFICATION

FOR

FERRITIC SS SEALING DISC

REF. USI NO. : 33111

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REVISION CONTROL SHEET

DOCUMENT TYPE : TECHNICAL SPECIFICATION

NO.: PC-M-971

TITLE: FERRITIC SS SEALING DISC

REV. NO. & DATE	DESCRIPTION OF REVISION	PREPARED BY	CHECKED BY	REVIEWED BY	APPROVED BY
0 Dec., 2013	Original (Pages : 12)	A.K.Shit R.K.Gupta Braham Prakash	P.B.Rshikesan D.Ganesh M.R.S.Saxena	S.N.Kamath M.K.Sharma	U.C. Muktibodh

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 नलपीसीओईएल NPCIL	NUCLEAR POWER CORPORATION OF INDIA LTD	
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	TECHNICAL SPECIFICATION	Rev. No. : 0
	FERRITIC S.S. SEALING DISCS	

1.0 SCOPE

This specification covers the additional requirements over and above "DIN – 17440 for the supply of ferritic stainless steel sealing discs X6 Cr 17 to material number 1.4016". All the requirements under this specification represent minimum requirements.

This specification is applicable for Steam Generators for projects beyond RAPP-7&8.

2.0 CONTENTS

The requirements of this specification are presented under the following section headings:

Description	Section
Scope	1.0
Content	2.0
Steel Melting	3.0
Chemical Composition	4.0
Mechanical Requirements	5.0
Tests and Test Sampling	6.0
Dimensional Check and Accuracies	7.0
Sub-Contracting	8.0
Marking and Identification	9.0
Reports	10.0
Third Party Inspection	11.0
Packing and Shipment	12.0

3.0 STEEL MELTING

The steel shall be melted in an electric furnace and shall be fully killed.

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4.0 CHEMICAL COMPOSITION

Both ladle and product analysis shall be carried out and shall meet the requirements as under;

C:	≤	0.08%
Si:	-	1.00 %.(max.)
Mn:	-	1.00 %.(max.)
Cr:	-	15.5% to 17.5%
P:	≤	0.045 %.
S:	≤	0.03%

5.0 MECHANICAL REQUIREMENTS

The following minimum requirements shall be met with

- (a) Tensile strength : 450-650 N/mm²
- (b) Yield Strength : 270 N/mm²
- (c) % Elongation on 5d : 20
- (d) Cv Impact strength : 40 J. (Min.)

6.0 TESTS AND TEST SAMPLING

The samples are to be taken from the centre of the head and foot of the rolled plate for every melt.

6.1 Melt Analysis

For each melt the chemical analysis shall be carried out and the results shall conform to the requirements of Para 4.0.

6.2 Tensile Test

One longitudinal specimen, each from head and foot of plate is to be tested for each melt and each heat-treatment stage. The tests shall be carried out in

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	FERRITIC S.S. SEALING DISCS	

accordance with DIN 50125 and results shall conform to the requirements of Para 5.0

6.3 Impact Test

One set of ISO-V longitudinal specimen, each from head and foot of a plate for each melt and each heat treatment stage shall be tested at 25° C and results shall conform to requirements of Para 5.0.

6.4 Hardness Test

A hardness test shall be carried out for each plate and for each melt from the head and foot according to Brinells Method. The values shall be between 130-170 HB.

6.5 Material Mix-up Test

Every material shall be tested to find out if there is any material mix-up.

7.0 DIMENSIONAL CHECK AND ACCURACIES

7.1 Surface Roughness

- Peak to valley height of the cam profile Rt 4 Micron.
- Peak to valley height of the remaining surface Rt 16 micron.

7.2 Dimensional deviations may be according to "DIN 7168 -m".

7.3 Parallelism of the cam profile in circumferential and radial direction = 0.1 mm.

7.4 Flatness of the cam profile sealing disc back side 01. mm.

7.5 In case external diameter is 400 mm the extent of testing restricted to 50 mm from the external diameter and flatness for the remaining area shall be 0.2 mm.

7.6 The profile and dimensions shall be according to relevant Purchaser's drawings Project name/33111/4033/DD and 4034/DD.

 एनपीसीआईएल NPCIL	NUCLEAR POWER CORPORATION OF INDIA LTD	
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8.0 SUB-CONTRACTING

If the supplier proposes to sub-contract any part of the job, the same can be done only after the specific approval of the Purchaser.

9.0 MARKING AND IDENTIFICATION

9.1 Identification

The following shall be clearly stamped on each disc and test samples before dispatch:

- (a) Heat number / Melt number
- (b) Specification and grade
- (c) Manufacturer's name / seal
- (d) Inspecting Authority / Purchaser's seal

The stamping shall be done using a round nosed steel die stamp and shall lie on the middle of the cam profile sealing disc after finish machining.

9.2 Marking

The following shall be clearly marked using halogen and sulfur free paint:

- (a) Purchase Order Number
- (b) Serial number (as in Purchase Order)
- (c) Size
- (d) Destination

10.0 REPORTS

The following reports shall be submitted in 10 copies each at least 15 days after testing :

- (a) Chemical Analysis Report

 ननपीसीआरएन NPCIL	NUCLEAR POWER CORPORATION OF INDIA LTD	
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- (b) Mechanical Test Report
- (c) Hardness Survey Report
- (d) Mix-up Test Report
- (e) Dimensional Inspection Report

Final reports containing all the above shall also be submitted in soft form (pdf format) with proper indexing.

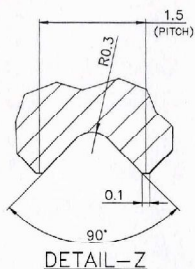
11.0 **THIRD PARTY INSPECTION**

The inspection agency shall witness all the tests and examinations and shall certify that material being supplied is fully conforming to this specification. The required documentation shall be countersigned by the appointed third party inspection.

12.0 **PACKING AND SHIPMENT**

The sealing discs shall be suitably packed for sea-worthy transportation. Sufficient care is to be taken for adequate protection against soiling and humidity. Halogen and sulfur free packing materials shall be used. The container of the disc shall be so dimensioned and constructed that there is no displacement of the contents in case of overturning or shifting. The proposed packing shall also be suitable for long storage. Refer Packing Drawing No. Project Name / 33111 / 4036 / DD.

ALL DIMENSIONS ARE IN MILLIMETERS

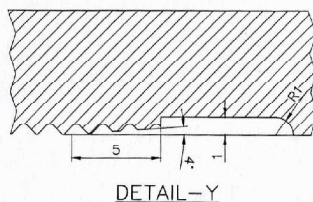
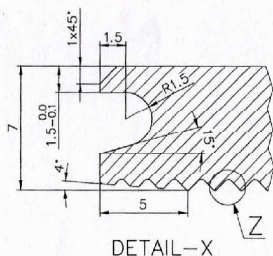


THE TOLERANCE FOR FLATNESS, OVER A RING OF 50 WIDTH AS SHOWN, SHALL BE 0.1
OVER OTHER AREAS THE SAME SHALL BE 0.2

VAR NO.	ØA	ØB	ØC
01	572	525	510
02	600	555	540

NOTES: —

1. MATERIAL SPECIFICATION : DIN17440-1.4016
2. APPLICABLE SPECIFICATION : PC-M-971
3. PEAK TO VALLEY HEIGHT OF THE CAM PROFILE IS R1 4 MICRONS.
IT CAN BE MEASURED AND ENSURED ON PLANE SURFACE AND
INCLINED SURFACE OF CAM PROFILE REGION BEFORE MACHINING OF
CAM PROFILE FOR ALL VARIANTS.
4. PEAK TO VALLEY HEIGHT OF THE REMAINING SURFACE IS R1 16 MICRONS.
5. FOR PACKING DETAILS REFER DRG. NO. 3-93-170-05303.



TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS 2102-N)					
LINEAR				ANGULAR	
0.5 TO 3	±0.1	400 TO 1000	±0.8	0 TO 10	± 1'
3 TO 6	±0.1	1000 TO 2000	±1.2	10 TO 50	± 30'
6 TO 30	±0.2	2000 TO 4000	±2.0	50 TO 120	±20'
30 TO 120	±0.3	—	—	120 TO 400	± 10'
120 TO 400	±0.5	—	—	OVER 400	± 5'

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TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

700MWe/GHAVP-1&2
(REF: GHAVP-1&2/33111/4033/DD/R00)



Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620014

	NAME	SIGNATURE	DATE	NO. OF VAR
DRN	N. K.		180814	
CHD	EAK/RRV		200814	
APPD	A.S		220814	

REV	DATE	ALTERED :
		CHD&APPD :

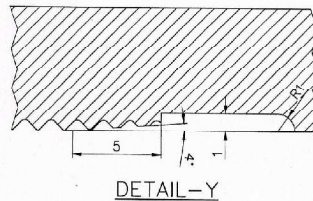
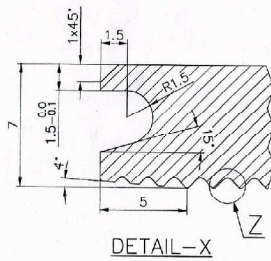
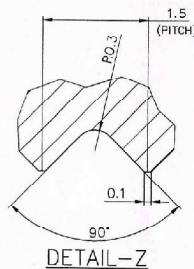
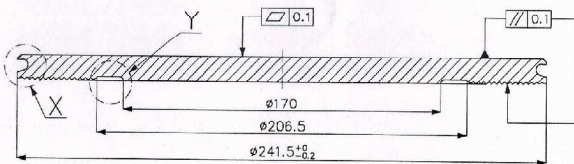
DATE:	NC	GRADE OF INSTR. DIM		SCALE	WEIGHT (Kg)	REF TO ASST / OLD DRG	ITEM NO	NO OF ITEMS
CODE	150	C/M/F		NTS	14.0 15.3	GHAYP-1&2/33111/4028/DD/ROO GHAYP-1&2/33111/4029/DD/ROO	2	2
TITLE					CARD CODE	DRAWING NO :		REV
SEALING DISC-1					U 01	3-93-170-05300		00

Size A3

3-93-170-05301

DRAWING NO.

ALL DIMENSIONS ARE IN MILLIMETERS



NOTES: -

1. MATERIAL SPECIFICATION : DIN17440-1.4016
2. APPLICABLE SPECIFICATION : PC M 071
3. PEAK TO VALLEY HEIGHT OF THE CAM PROFILE IS R1.4 MICRONS. IT CAN BE MEASURED AND ENSURED ON PLANE SURFACE AND INCLINED SURFACE OF CAM PROFILE REGION BEFORE MACHINING OF CAM PROFILE FOR ALL VARIANTS.
4. PEAK TO VALLEY HEIGHT OF THE REMAINING SURFACE IS R1.6 MICRONS.
5. FOR PACKING DETAILS REFER DRG. NO. 3-93-170-05303.

TOLERANCE IF NOT SPECIFIED SHALL BE AS BELOW (REFER IS 2102-n)

LINEAR		ANGULAR	
0.5 TO 3	± 0.1	400 TO 1000	± 0.8
3 TO 6	± 0.1	10 TO 50	± 30'
6 TO 30	± 0.2	50 TO 120	± 20'
30 TO 120	± 0.3	120 TO 400	± 10'
120 TO 400	± 0.5	OVER 400	± 5'

REV DATE ALTERED :
CHD&APPD :

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TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

700MWe/GHAVP-1&2
(REF: GHAVP-1&2/33111/4034/DD/ROO)



Bharat Heavy Electricals Ltd
UNIT. HIGH PRESSURE BOILER PLANT
TIRUCHIRAPALLI - 620014

DRN	NAME	SIGNATURE	DATE	NO. OF
	N.K.		180814	VAR
CHD	EAK/RRV		200814	
APPD	A.S		220814	

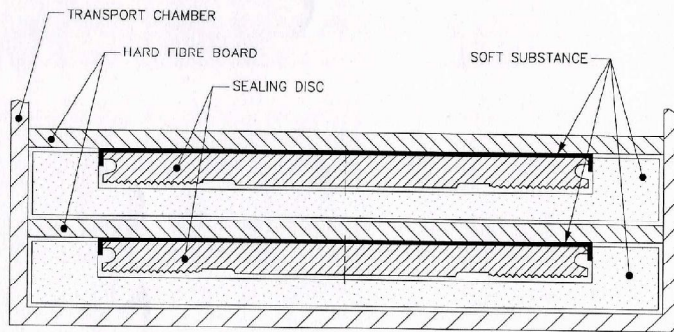
DEPT	NC	GRADE OF UTSTL DIM		SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	NO. OF ITEMS
	150	C/M/V		NTS	2.5	GHAVP-1&2/33111/4030/DD/ROO	2	
TITLE					CARD CODE	DRAWING NO :		REV
SEALING DISC-2					U 01	3-93-170-05301		00

Size A3

3-93-170-05303

UN DIMENSION

ALL DIMENSIONS ARE IN MILLIMETERS



NOTES:-

1. APPLICABLE SPECIFICATION : PC-M-971

REV	DATE	ALTERED :
		CHD&APPD :

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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		700MWe/GHAVP-1&2 (REF: GHAVP-1&2/33111/4036/DD/R00)						
	Bharat Heavy Electricals Ltd		DRN	N.K.	SIGNATURE	DATE	NO. OF VAR	
	UNIT. HIGH PRESSURE BOILER PLANT		CHD	EAK/HKV		200814		
	TIRUCHIRAPALLI - 620014		APPD	A.S.		220814		
DROPT NC CODE 150	GRADE OF UNTOL DIM C/M/F		SCALE NTS	WEIGHT (Kg) --	REF TO ASST / OLD DWG --		ITEM NO --	No. OF ITEMS --
TITLE PACKING DETAILS FOR SEALING DISCS				CARD CODE U 01	DRAWING NO : 3-93-170-05303		REV 00	

Size A3

Advanced Technology Product
High Pressure Boiler Plant

Generic QAP for Sealing Disc

CUSTOMER	Nuclear Power Corporation of India Limited (NPCIL)
PROJECT	Gorakhpur Haryana Anu Vidyut Pariyojna (GHAHP-1&2)
W.O.	D157 to D160-001-1-93-171

BHEL / Quality Assurance & Engineering			NPCIL
Prepared by:	Reviewed by:	Approved by:	
O R NITHIN 21/09/2018	S LAKSHMI 21/09/18	A SUNDARARAJAN 21/9/18	21/9/2018
M. ARUN KUMAR	M LAKSHMINARASIMHAN		CRK (upta) NPCIL

REVISIONS			
REVISION No.	DATE	DESCRIPTION	ORIGINATOR
00	21-09-2018	Initial Issue	M. ARUN KUMAR

Sl. No	Component & Operations	Characteristics	Type of Check	Quantum Of check	Reference Document	Acceptance Norms	Format of Record	Agency			Remarks
								M	B	N	
1.	2.	3.	4.	5.	6.	7.	8.	D*	9.	**	10.
1.0 Raw Material :											
1.1	Steel Melting: Melting in electric furnace	Steel shall be fully killed	Record Verification	100%	PC-M-971/00 MPP: To be submitted	TC	√	P	R	R	Steel shall be fully killed.
1.2	Ladle Analysis	Chemistry	Chemical analysis	1/Melt	PC-M-971/00 MPP: To be submitted	TC	√	P	R	R	---
1.3	Ingot identification	Identification	Visual	100%	PC-M-971/00 MPP: To be submitted	RD	√	P	R	R	---
2.0 In process Controls :											
2.1	Preliminary Heating of raw material (If process is Hot forming)	Temperature	Record verification	100%	EN 10088-3:2005 MPP: To be submitted	RD	--	P	R	--	---
2.2	Forming Process	MWD(Main Working Direction)	Record verification	100%	EN 10088-3:2005 MPP: To be submitted	TC	√	P	R	--	---
2.3	Marking after Rolling	Identifications	Verification and Visual	100%	PC-M-971/00, Table A.1	RD	--	P	R	--	---

Prepared	Reviewed & Approved	Reviewed & Approved	Reviewed & Approved
SUPPLIER'S NAME: To be filled			
BHEL		NPCIL	

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
 ** M: SUPPLIER B: BHEL N: NPCIL/TPI
 P: PERFORM R: REVIEW W: WITNESS AND H: HOLD
 TC: TEST CERTIFICATE RD: RECORD

Nair
 21/09/18
 (NITHIN-O-R)

Arjun Kumar
 21/09/18
 (M. ARJUN KUMAR)

Ramkrishna
 21/09/18
 (R. KRISHNA) NPCIL

Supplier's LOGO	Supplier's Name and Address		Generic Quality Plan for Sealing Disc								Project: GHAVP 1& 2 W.O.: D157 to D160-001-1-93-171 P.O No: To be filled		
			Item : Sealing Disc Material: EN10088-3, 1.4016 Sub-system: Steam Generator			QP No.: To be filled by Supplier Rev.No.: To be filled by Supplier Date: To be filled by Supplier Page No:2 of 4							
2.4	Heat Treatment (Annealing)	R.O.H , Soaking Temp & Time, R.O.C	Review of HT Chart	100%	EN 10088-3:2005	TC	√	P	W	R	Chart shall be signed at the start and End of Heat treatment and submitted along with TC		
2.5	Machining for UT & Ultrasonic examination	~~NORMAL~~ and Angle Beam UT	Record verification	100%	UT procedure: To be submitted	RD	√	P	H	W	---		
2.6	Identification of Test coupon and Cutting	Location and orientation	Visual & Measurement	100%	PC-M-971/00 MPP & MSTP: To be submitted	RD	√	P	H	W	---		
2.7	Specimens preparation- Dimension Inspection	Dimensions	Measurement	100%	MSTP: To be submitted PC-M-971/00	RD	--	P	R	R	---		
2.8	Mechanical Tests :												
2.8.1	Product analysis	Chemistry	Chemical analysis	For each Melt	PC-M-971/00 MPP: To be submitted	TC	√	P	W	W	---		
2.8.2	Tensile at RT (Longitudinal to Rolling Direction)	Tensile Strength, Yield Strength (0.2% offset), % Elongation on 5d	Destructive Test	1/head & 1/foot of the plate for each melt & each HT Batch	PC-M-971/00 MSTP: To be submitted DIN 50125	TC	√	P	H	W	--		

				LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: SUPPLIER B: BHEL, N: NPCIL/TP P: PERFORM R: REVIEW W: WITNESS AND H: HOLD TC:TEST CERTIFICATE RD: RECORD
Prepared	Reviewed & Approved	Reviewed & Approved	Reviewed & Approved	
SUPPLIER'S NAME: To be filled		BHEL	NPCIL	

Noted 21/05/18 *OK* 21/09/18 *Review* 21/11/18

Supplier's LOGO	Supplier's Name and Address		Generic Quality Plan for Sealing Disc							Project: GHAVP 1& 2 W.O.: D157 to D160-001-1-93-171 P.O No: To be filled		
			Item : Sealing Disc Material: EN10088-3, 1.4016 Sub-system: Steam Generator		QP No.: To be filled by Supplier Rev.No.: To be filled by Supplier Date: To be filled by Supplier Page No:3 of 4							
2.8.3	Tensile at 350° (Longitudinal to Rolling Direction)	Tensile Strength, Yield Strength (0.2% offset), % Elongation on 5d	Destructive Test	1/head & 1/foot of the plate for each melt & each HT Batch	PC-M-971/00. DIN 50125. MSTP: To be submitted. Test result is for information purpose only	TC	√	P	H	W	--	
2.8.4	Impact Test at +25°C (Longitudinal to Rolling Direction)	Cv impact Strength	Destructive Test	3/head & 3/foot of the plate for each melt & each HT Batch	PC-M-971/00 MSTP: To be submitted EN10088-3	TC	√	P	H	W	----	
2.9	Inter Granular Corrosion Resistance Test	Corrosion Test	Destructive test	1/Melt/HT batch	PC-M-971/00 MSTP:To be submitted EN10088-3	TC	√	P	W	W	--	
2.10	Hardness	Hardness	Brinell Hardness	1/ head & 1/foot of each plate for each melt & each HT Batch	PC-M-971/00 EN10088-3 130-170HB	TC	√	P	W	R	Hardness survey report shall also be submitted	
2.11	Material Mix up test	Material Mix up	----	all	PC-M-971/00	RD	√	P	R	R	---	

				LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: SUPPLIER B: BHEL, N: NPCIL/TPI P: PERFORM R: REVIEW W: WITNESS AND H: HOLD TC: TEST CERTIFICATE RD: RECORD
Prepared	Reviewed & Approved	Reviewed & Approved	Reviewed & Approved	
SUPPLIER'S NAME: To be filled		BHEL	NPCIL	

NAIR 21/09/18
Chy 21/09/18
Rm 21/09/2018

Supplier's LOGO	Supplier's Name and Address	Generic Quality Plan for Sealing Disc					Project: GHAVP 1& 2				
		Item : Sealing Disc Material: EN10088-3, 1.4016 Sub-system: Steam Generator			QP No.: To be filled by Supplier Rev.No.: To be filled by Supplier Date: To be filled by Supplier Page No: 4 of 4		W.O.: D157 to D160-001-1-93-171 P.O No: To be filled				
3.0 Final Machining as per Drawing											
3.1	Final Dimension check	Dimensions	Measurement	As per Drg.	As per Specification PC-M- 971 and Drg. 3-93-170-05300/00 & 3-93-170-05301/00	TC	--	P	W	W	--
		Sizes, Thickness, CAM Profile, Flatness, Parallelism									
		Visual (free from defects)	Visual	100%	--	TC	--	P	W	W	--
		Marking	Visual	100%	As per Specification PC-M-971 and Test Certificate	TC	--	P	W	W	--
3.2	Surface finish on CAM profile and other surfaces	As per Drawing	Comparative	100%	As per Specification PC-M-971	TC	--	P	W	W	--
4.0 Final Inspection											
4.1	Visual Inspection	Free from visual defects	Verification and Visual	100%	PC-M-971/00	TC	√	P	W	R	---
4.2	Marking	As per Specification -	Verification and Visual	100%	PC-M-971/00	TC	√	P	R	R	---
4.3	Certification and Documentation Control	Order compliance	Certificate compilation	100%	PC-M-971/00	TC	√	P	R	R	---
4.4	Documents (Test Certificates) shall be sent to BHEL/Trichy prior to dispatch. Dispatch clearance will be given after Acceptance of Test Certificates by BHEL&NPCIL)										
4.5	Packing & Shipment	Packing	Visual	100%	As per Drg. No. 3-93-170-05303/00	---	--	P	R	R	---

Note:

1. MSTP (Material Sampling Plan), MPP (Manufacturing Process plan), Heat Treatment Plan, Ultrasonic Test Procedures etc. shall be submitted by Supplier and the same will be subjected to both BHEL & NPCIL approval.

Prepared	Reviewed & Approved	Reviewed & Approved	Reviewed & Approved	LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: SUPPLIER B: BHEL, N: NPCIL/TPI P: PERFORM R: REVIEW W: WITNESS AND H: HOLD TC: TEST CERTIFICATE RD: RECORD
SUPPLIER'S NAME: To be filled		BHEL	NPCIL	

NRB
21/9/18

Aj Jay
21/9/18

Rmng
21/9/18