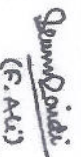
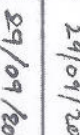
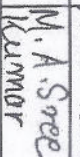


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		QUALITY ASSURANCE PLAN		QAP No.	RAPP-7&8/QAP/51130/01
				Rev No.	RO
ISOLATED PHASE BUS DUCT & ACCESSORIES				Date	29.09.2014
Project : RAJASTHAN ATOMIC POWER PROJECT - 7/8 PACKAGE CONTRACTOR Larsen & Toubro Limited Pankaj Building, Opp. GEB Substation NH No. 8, Chandel Vadodara-391740, Gujarat				Package : ISOLATED PHASE BUS DUCT & ACCESSORIES VENDOR NAME AND ADDRESS BHEL, Rudrapur Component Fabrication Plant, Kichha By Pass Road Rudrapur, Udham Singh Nagar Uttarakhand, PIN-263153, E-Mail: faraz@bhel.in	
L&T CORRESPONDENCE DETAILS : Phone No.: 0265-2456855, 0265-2456833 FAX No. : 0265-2455030 E-mail ID: sree.kumar@ltpower.com, sanjay.pandey@ltpower.com				M/s. BHEL Checked by:  Reviewed by: Signature Approved by: Signature	
NPCL PURCHASE ORDER NUMBER : CMM/MEQ/22-40-2-1067/PO/6458/59 Dt: 03.12.12 PACKAGE CONTRACTOR (M/s BHEL)'S PURCHASE ORDER NUMBER : EPC/EEI/21000-22794/SRD DT 15.10.2013				SUB-VENDOR NAME AND ADDRESS NA	
SUB VENDOR PURCHASE ORDER NUMBER : L M F				WORK ORDER NUMBER : NA	
NPCL TECH SPEC NO.: RAPP-7&8/40000/PS/M/S-1 Section C-2.3 (PC-E-851), RAPP-7&8/PC-E/6613 Rev RO				L&T QAP No.:	RAPP-7&8/QAP/51130/01
				DESIGN CODE	IS 8084, IEEE C37.23
Q.A. Ref No. : 2131469 Data Sheet for Isolated Phase Bus Duct Item : ISOLATED PHASE BUS DUCT & ACCESSORIES				SUB-VENDOR Checked By: Reviewed by: Approved by:	
For L&T Name: Signature: Date:			For NPCL Name: Signature: Date:		
Checked by	MAYANIK PANDAY		29/09/2014	Checked by	G.N. BANGOLK
Reviewed by	NITAV PATEL		29/09/2014	Reviewed by	PAVESH KUMAR
Approved by	M.A. SREE KUMAR		29/09/2014	Approved by	JAYANTH KUMAR
				Date: 01-10-2014 Date: 08-10-2014 Date: 29-10-2014	



(Approved on behalf of project unit.)



QUALITY ASSURANCE PLAN

ISOLATED PHASE BUS DUCT & ACCESSORIES

QAP NO: RAP-788/QAP/51130/01 REV: 00 DATE: 29.09.14
 CLIENT: M/S NPCIL
 EPC CONTRACTOR: M/S L&T
 PROJECT: BOTI PACKAGE RAP 788
 NPCIL PO NO.: CMM/MEO/22-40-2-1067/PO/6458/59 DATE: 09-12-2012

SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
									P	W	R	H	
1.0	RAW MATERIAL												
1.1	Aluminium Sheets for Main and Tap-off bus duct enclosure, metallic bellows and aluminium flexibles	a) Visual Inspection	Major	Physical	100 %	PS	PS	IR	3		2,1		
		b) Dimensions (thickness)	Major	Measurement	5 samples/lot	Appd TDS	Appd TDS	IR	3		2,1		
		c) Surface finish	Minor	Visual	100 %	PS	PS	IR	3		2,1		
		d) Bend Test (if applicable)	Major	Mechanical	1 sample/lot			TR	4		3,2,1		
		e) Tensile Strength	Major	Mechanical	3 sample/lot	IS : 5082	IS : 5082	TR	4		3,2,1		
		f) % Elongation	Major	Mechanical	1 sample/lot	IS : 737	IS : 737	TR	4		3,2,1		
		g) Chemical composition	Major	Chemical	1 sample/lot			TR	4		3,2,1		
		h) Electrical Conductivity (if applicable as per IS)	Major	Electrical	1 sample/lot			TR	4,3	2	1		
1.2	Aluminium for Conductor (extrusion & plates)	a) Visual Inspection	Major	Physical	100 %	PS	PS	IR	3		2,1		
		b) Dimensions (thickness)	Major	Measurement	5 samples/lot	Appd TDS	Appd TDS	IR	3		2,1		
		c) Surface finish	Major	Visual	100 %	PS	PS	IR	3		2,1		
		d) Tensile Strength	Major	Mechanical	1 sample/lot	IS : 5082	IS : 5082	TR	4		3,2,1		
		e) % of Elongation	Major	Mechanical	1 sample/lot	IS : 63401	IS : 63402	TR	4		3,2,1		
		f) Chemical composition	Major	Chemical	1 sample/lot			TR	4		3,2,1		
		g) Electrical Conductivity	Critical	Electrical	1 sample/lot			TR	4,3	2	1		
		a) Dimensions	Major	Measurement	100 %	Appd TDS	Appd TDS	IR	4	3	2,1		
1.3	Copper Flats/Copper Braided Flexibles	b) Surface finish	Minor	Visual	100 %	PS	PS	IR	4	3	2,1		
		c) Chemical Composition	Major	Chemical	1 sample/lot	IS : 191	IS : 191	TR	4		3,2,1		
		d) Tensile Strength	Critical	Mechanical	1 sample/lot	IS : 613/IS : 1897	IS : 613/IS : 1897	TR	4		3,2,1		
		e) % of Elongation	Critical	Mechanical	1 sample/lot	IS : 613/IS : 1897	IS : 613/IS : 1897	TR	4		3,2,1		
		f) Silver Plating for flexible connector	Critical	Measurement	1 sample/lot	PS	PS	IR	4	3	2,1		
		g) Electrical Conductivity	Critical	Electrical	1 sample/lot	IS : 613/IS : 1897	IS : 613/IS : 1897	TR	4	3	2,1		
		h) Pull test on flexible conductor	Critical	Mechanical	1 sample/lot	PS	PS	TR	4	3	2,1		
		a) Dimensions	Major	Measurement	100 %	Appd TDS	Appd TDS	IR	4		3,2,1		
1.4	CRCA Sheet (For Outside shell)	b) Surface finish	Minor	Visual	100 %	PS	PS	IR	4		3,2,1		
		c) Bend Test (if applicable)	Major	Mechanical	1 sample/lot	IS : 513	IS : 513	TR	4		3,2,1		

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 BHEL
 283153



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 NPCIL

QUALITY ASSURANCE PLAN									
ISOLATED PHASE BUS DUCT & ACCESSORIES									
QAP NO: RAPP-788/QAP/51130/01				REV: 00		DATE: 29.09.14			
CLIENT: M/s NPCIL				BPC CONTRACTOR: M/s L&T					
PROJECT: BOTI PACKAGE RAPP 788				NPCL PO NO: CHM/MEQ/22-40-2-1067/PO/6458/59		DATE: 09-12-2012			
SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	REMARKS
1.5	Steel Structure ISM/SMC/ISA	a) Dimensions b) Surface finish c) Bend Test d) Chemical composition	Major	Measurement Visual Mechanical Chemical	10 % 100 % 1 sample/lot 1 sample/lot	Appd TDS / Dtg PS IS: 2062 IS: 2062	Appd TDS / Dtg PS IS: 2062 IS: 2062	IR 4 4 4 4	3,2,1 3,2,1 3,2,1 3,2,1
2.0	BOUGHTOUT ITEMS	Acceptance / Routine Tests	Major	Physical	100 %	PS	PS	IR	4
2.1	Epoxy Seal - off bushing	a) Visual Examination b) Creepage distance c) Dimension d) Dry 1 min. PF voltage withstand e) Insulation Resistance f) Partial Discharge g) Lightning Impulse voltage withstand h) Water absorption test i) Flammability test	Major	Physical Measurement Electrical Electrical Electrical Electrical Electrical Physical Electrical	100 % 100 % 100 % 100 % 100 % 1 Sample 1 Sample	BHEL Dtg / TDS BHEL Dtg / TDS IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431	BHEL Dtg / TDS BHEL Dtg / TDS IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431 IS: 2099/IS9431	IR 4 4 4 4 4 4 4 4	3 2,1 2,1 2,1 2,1 2,1 2,1 2,1 2,1
2.2	Insulators (Porcelain)	Acceptance Tests a) Visual b) Dimensions c) Creepage distance d) Dry 1 min. PF voltage withstand e) Impulse voltage withstand test f) Temperature cycle test g) Cantilever test h) Porosity test i) Mechanical test j) Porcelain eccentricity	Major	Visual Measurement Electrical Electrical Thermal Physical Mechanical Mechanical	100 % 5% per lot 1 Sample/lot 100 % 1 Sample 1 Sample/lot 1 Sample 1 Sample/lot 1 Sample 1 Sample	PS BHEL Dtg / TDS BHEL Dtg / TDS IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 4318	PS BHEL Dtg / TDS BHEL Dtg / TDS IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 4318	IR 4,3 4,3 4,3 4 4 4 4 4 4	2,1 2,1 2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1
Note: Valid type test certificate for above '0' marked characteristics shall be furnished to NPCL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCL QS Engineer.									
Witness by 2.1 shall be done during final assembly inspection at BHEL									

APPROVED BY:  Bimal Banerjee
BHEL, Rourkela
BHEL - 769003 (Urban) - 769003

APPROVED BY:
L T



APPROVED BY
NPCL



QUALITY ASSURANCE PLAN

ISOLATED PHASE BUS DUCT & ACCESSORIES

QAP NO: RAPP-788/QAP/51130/01 REV: RO DATE: 29.09.14
 CLIENT: M/S NPCIL
 EPC CONTRACTOR: M/s L&T
 PROJECT: BOTM PACKAGE RAPP 788
 NPCIL PO NO: CMM/MEQ/22-40-2-1067/PO/658/59 DATE: 09-12-2012

SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
									P	W	R	H	
2.3	Voltage Transformer	Routine Tests a) Visual Examination b) Dimensions c) Verification of terminal marking and polarity d) PF Voltage test on primary & sec winding e) Partial discharge test f) Determination of errors g) HV/PF Voltage test on secondary winding & between section *Type Tests h) Heat run test i) Impulse voltage with stand test Note: Valid type test certificate for above "a" marked characteristic(s) shall be furnished to NPCIL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCIL QS Engineer.	Major Major Major Major Major Major Critical Critical Critical Critical Critical	Visual Measurement Electrical Electrical Electrical Electrical Electrical Electrical Electrical Electrical Electrical	100 % 100 % 100 % 100 % 100 % 100 % 100 % 1 Sample 1 Sample	BHEL Appd Drg BHEL Appd Drg BHEL Appd Drg IS: 3156 IS: 3156 IS: 3156 IS: 3156 IS: 3156 IS: 3156 IS: 3156 IS: 3156	BHEL Appd Drg BHEL Appd Drg BHEL Appd Drg IS: 3156 IS: 3156 IS: 3156 IS: 3156 IS: 3156 IS: 3156 IS: 3156 IS: 3156	TR TR TR TR TR TR TR TR TR TR TR	4 4 4 4 4 4 4 4 4 4 4	3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1	1 1 1 1 1 1 1 1 1 1 1	Witness of 1 sample of each type/rating by 3/2/1 at Equipment Manufacturer's Works.	
2.4	Current Transformer	Routine Tests/ Acceptance test a) Visual Examination b) Dimensions c) Verification of terminal marking and polarity d) PF Voltage test on secondary winding & between section e) Over Voltage Inter - turn test f) Determination of errors according to the requirement of appropriate accuracy class g) Partial discharge test h) PF Voltage test on primary winding *Type Tests i) Impulse with stand test j) Temperature rise test	Major Major Major Critical Major Major Major Major Major Major Major	Visual Measurement Electrical Electrical Electrical Electrical Electrical Electrical Electrical Electrical Electrical	100 % 100 % 1 Sample 1 Sample 100 % 100 % 100 % 1 Sample 1 Sample	BHEL Appd Drg BHEL Appd Drg BHEL Appd Drg IS: 2705 IS: 2705 IS: 2705 IS: 2705 IS: 2705 IS: 2705 IS: 2705 IS: 2705	BHEL Appd Drg BHEL Appd Drg BHEL Appd Drg IS: 2705 IS: 2705 IS: 2705 IS: 2705 IS: 2705 IS: 2705 IS: 2705 IS: 2705	TR TR TR TR TR TR TR TR TR TR TR	4 4 4 4 4 4 4 4 4 4 4	3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1	1 1 1 1 1 1 1 1 1 1 1	Witness of 1 sample of each type/rating by 3/2/1 at Equipment Manufacturer's Works.	

APPROVED BY: BHEL, Rourkela
 1 year (from the date of Manufacturer's Quality & Warranty)
 BHEL, Rourkela
 283163 Udhavans-283163

APPROVED BY: L T
 Page 4 of 4



APPROVED BY NPCIL

As per CRB dated 16.09.2014 for standing regular production

QUALITY ASSURANCE PLAN													
ISOLATED PHASE BUS DUCT & ACCESSORIES													
QAP NO: RAPP-7&8/QAP/51130/01													
CLIENT: M/s NPCIL													
EPC CONTRACTOR: M/s L&T													
PROJECT: BOTI PACKAGE RAPP 7&8													
NPCL PO NO: CMN/MEQ/22-40-2-1067/PO/6458/59 DATE: 09-12-2012													
S/L NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
									P	W	R	H	
2.5	Surge Arrestors	Note: Valid type test certificate for above "1" marked characteristic(s) shall be furnished to NPCL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCL QS Engineer.											
		Acceptance test											
		a) Measuring of PF Voltage	Major	Electrical	1 Sample	IEC 99.4	IEC 99.4	TR	4	3	2,1	1	
		b) Lighting Impulse residual voltage	Major	Electrical	1 Sample	IEC 99.4	IEC 99.4	TR	4	3	2,1	1	
		c) Partial Discharge test	Major	Electrical	1 Sample	IEC 99.4	IEC 99.4	TR	4	3	2,1	1	
		Routine Tests											
		d) Dimension and visual examination	Major	Electrical	100 %	BHEL Appd Drg	BHEL Appd Drg	TR	4	3	2,1	1	
		e) Measurement of PF reference voltage	Major	Electrical	100 %	IEC 99.4	IEC 99.4	TR	4	3	2,1	1	
		f) Residual Voltage	Major	Electrical	100 %	IEC 99.4	IEC 99.4	TR	4	3	2,1	1	
		g) Partial Discharge	Major	Electrical	100 %	IEC 99.4	IEC 99.4	TR	4	3	2,1	1	
		h) Leakage test	Major	Electrical	100 %	IEC 99.4	IEC 99.4	TR	4	3	2,1	1	
		*Type Tests											
		i) Lightning impulse voltage test	Major	Electrical	1 Sample	IEC 99.4	IEC 99.4	TR	4		3,2,1	1	
		j) Switching surge operating duty test	Major	Electrical	1 Sample	IEC 99.4	IEC 99.4	TR	4		3,2,1		
		k) Residual voltage test	Major	Electrical	1 Sample	IEC 99.4	IEC 99.4	TR	4		3,2,1	1	
Note: Valid type test certificate for above "1" marked characteristic(s) shall be furnished to NPCL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCL QS Engineer.													
2.6	Neutral Grounding Transformer	Routine Tests											
		a) Visual Examination	Major	Visual	100 %	PS	PS	TR	4	3,2,1			
		b) Dimensions	Major	Measurement	100 %	PS	PS	TR	4	3,2,1			
		c) Measurement of winding resistance	Major	Electrical	100 %	IS: 11171	IS: 11171	TR	4	3,2,1			
		d) Measurement of load loss & No load current	Major	Electrical	1 Sample	IS: 11171	IS: 11171	TR	4	3,2,1			
		e) Measurement of IR	Major	Electrical	100 %	IS: 11171	IS: 11171	TR	4	3,2,1			
		f) Separate source voltage withstand test	Major	Electrical	100 %	IS: 11171	IS: 11171	TR	4	3,2,1			
		g) Measurement of voltage ratio	Major	Electrical	100 %	IS: 11171	IS: 11171	TR	4	3,2,1			
		h) Induced over voltage withstand test	Major	Electrical	100 %	IS: 11171	IS: 11171	TR	4	3,2,1			1
Witness at Equipment manufactures Works.													

APPROVED BY:  Binai Banerjee
 Director (Quality & Safety)
 BHEL, Rourkela
 BHEL
 Reference - 283153 Uthmaniyah-283153



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 NPCL



QUALITY ASSURANCE PLAN

ISOLATED PHASE BUS DUCT & ACCESSORIES

QAP NO: RAPP-7&8/QAP/51130/01 REV: RO DATE: 29.09.14
 CLIENT: M/s NPCIL
 EPC CONTRACTOR: M/s L&T
 PROJECT: BOTI PACKAGE RAPP 7&8
 NPCIL PO NO: CMM/MEQ/22-40-2-1067/PO/6458/59 DATE: 09-12-2012

SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
									P	W	R	H	
		* Type Tests											
		i) Temperature rise test	Major	Electrical	1 Sample	IS : 11171	IS : 11171	TR	4		3,2,1	1	
		j) Lightning Impulse test	Major	Electrical	1 Sample	IS : 11171	IS : 11171	TR	4		3,2,1	1	
		k) Partial discharge test (applicable for encapsulated windings only)	Major	Electrical	1 Sample	IS : 11171	IS : 11171	TR	4		3,2,1	1	
		l) Short circuit test	Major	Electrical	1 Sample	IS : 11171	IS : 11171	TR	4		3,2,1	1	
		m) Acoustic sound level measurement	Major	Electrical	1 Sample	IEC 60076-10	IEC 60076-10	TR	4		3,2,1		
		Note: Valid type test certificate for above ** marked characteristics shall be furnished to NPCIL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCIL QS Engineer.											
		Routine Tests											
		a) Visual Examination	Major	Visual	100 %	PS	PS	TR	4	3	2,1		
		b) Dimensions	Major	Measurement	100 %	BHEL Apptd Org	BHEL Apptd Org	TR	4	3	2,1		
2.7	Neutral Grounding Resistor	c) Surface finish	Major	Visual	100 %	PS	PS	TR	4	3	2,1		
		d) Measurement of resistance	Major	Electrical	100 %	IEEE : 32	IEEE : 32	TR	4	3	2,1		
		e) PF High voltage withstand test	Major	Electrical	100 %	IEEE : 32	IEEE : 32	TR	4	3	2,1		
		f) Insulation resistance value	Major	Electrical	100 %	IEEE : 32	IEEE : 32	TR	4	3	2,1		
		* g) Temperature rise test	Major	Electrical	1 Sample	IEEE : 32	IEEE : 32	TR	4	3	2,1	1	
		Note: Valid type test certificate for above ** marked characteristics shall be furnished to NPCIL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCIL QS Engineer.											
		Routing Tests											
		a) Line Voltage	Major	Visual	100 %	PS	PS	TR	4		3,2,1		
		b) Insulation	Major	Visual	100 %	PS	PS	TR	4		3,2,1		
		c) Capacitance	Major	Visual	100 %	PS	PS	TR	4		3,2,1		
2.8	Surge Capacitors	d) Temp. Category	Major	Visual	100 %	PS	PS	TR	4		3,2,1		
		Routine Tests											
		a) Visual Examination	Major	Visual	100 %	PS	PS	TR	4	3	2,1		
		b) Dimensions	Major	Measurement	100 %	PS	PS	TR	4	3	2,1		
		c) Measurement of capacitance	Major	Electrical	100 %	IS : 11548	IS : 11548	TR	4	3	2,1	1	
		d) Dielectric loss angle test & Capacitance losses test	Major	Electrical	100 %	IS : 11548	IS : 11548	TR	4	3	2,1	1	
		e) Voltage test between terminals	Major	Electrical	100 %	IS : 11548	IS : 11548	TR	4	3	2,1		
		Note: Valid type test certificate for above ** marked characteristics shall be furnished to NPCIL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCIL QS Engineer.											
		Witness of 1 sample of each type/rating by 3 at Equipment Manufacturer's Works.											

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 BHEL
 203163

APPROVED BY
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 Page 6 of 15



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 NPCIL

 QUALITY ASSURANCE PLAN										
ISOLATED PHASE BUS DUCT & ACCESSORIES										
QAP NO: RAPP-788/QAP/51130/01 REV: 00 DATE: 29.09.14										
CLIENT: M/s NPCIL										
EPC CONTRACTOR: M/s L&T										
PROJECT: BOTI PACKAGE RAPP 788										
NPCIL PO NO.: CMM/MEQ/23-40-2-1067/PO/6458/59 DATE: 08-12-2012										
SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY	REMARKS
		i) Efficacy of discharge device test j) Sealing test *Type Tests k) Short circuit discharge test l) Partial discharge test m) Thermal stability test Note: Valid type test certificate for above "*" marked characteristic(s) shall be furnished to NPCIL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCIL QS Engineer.	Major Major Major Major Major	Electrical Visual Electrical Electrical Electrical	100 % 100 % 1 Sample 1 Sample 1 Sample	IS : 11548 IS : 11548 IS : 11548 IS : 11548 IS : 11548	IS : 11548 IS : 11548 IS : 11548 IS : 11548 IS : 11548	TR TR TR TR TR	P 4 W 4 R 3 H 3 2,1 2,1 3,2,1 3,2,1 3,2,1	
2.9	HT Fuse	a) Visual b) Type & rating c) Resistance / conductivity d) Dimensions e) Visual finish f) Surface finish g) Insulation resistance test h) Shore Hardness (Shore-A) i) Flame Test j) Ageing Test k) Compression & recovery test for bellows l) % Elongation & Tensile strength	Major Major Major Major Major Major Major Major Major Major Major	Visual Visual Electrical Measurement Visual Visual Electrical Mechanical Electrical Mechanical Measurement Mechanical	100 % 100 % 1 Sample 100 % 100 % 1 Sample 1 Sample 1 Sample 1 Sample 1 Sample 1 Sample	PS IEC 60282-1 PS PS PS PS PS PS PS PS PS	PS IEC 60282-1 PS PS PS PS PS PS PS PS PS	IR 3,4 IR 4 TR 4 TR 4 TR 4 TR 4 TR 4 TR 4 TR 4 TR 4 TR 4	2,1 3,2,1 2,1 2,1 2,1 2,1 2,1 2,1 3,2,1 3,2,1 2,1 3,2,1	
2.10	Rubber Bellows and gaskets									Witness at Equipment Manufacturer's Works or test laboratory


 Binod Kumar
 Approved By
 BHEL, Ruidapur
 Udaipur - 263163

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 Page 7 of 15


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QUALITY ASSURANCE PLAN										QAP NO: RAPP-788/QAP/51130/01	REV: R0	DATE: 29.09.14	
ISOLATED PHASE BUS DUCT & ACCESSORIES										CLIENT: M/S NPCL			
										EPC CONTRACTOR: M/S L&T			
										PROJECT: BOTI PACKAGE RAPP 788			
										NPCL PO NO.: CMM/MEO/22-40-2-1067/PO/6458/59 DATE: 03-12-2012			
SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
								P	W	R	H		
2.11	Bolts, nuts & washers (tests as applicable)	a) Visual b) Dimensions c) Chemical & Mechanical tests (for SS only) d) Surface coating (for MS only) e) Property Class (for MS only)	Major Major Major Major Major	Visual Measurement Chem. & Mech. Visual Visual	100% 2% per lot 1 sample/lot 1 sample/lot 1 sample/lot	PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg	PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg	IR IR TR TR TR	4/3 4/3 4 4 4				
2.12	Paint	a) Shade b) Consistency c) Flash Point test d) Drying Time e) Adhesion & Flexibility f) Scratch Hardness g) Viscosity h) Specific Gravity i) Corrosion resistance j) Wet opacity	Major Major Major Major Major Major Major Major Major Major	Visual Visual Thermal Measurement Measurement Measurement Measurement Measurement Measurement Measurement	100 % 100 % 1 Sample 1 Sample 1 Sample 1 Sample 1 Sample 1 Sample 1 Sample 1 Sample	Appd TDS / Drg IS : 5 PS 4 PS 4 PS 4 PS 4 PS 4 PS 4 PS 4 PS 4	Appd TDS / Drg IS : 5 PS 4 PS 4 PS 4 PS 4 PS 4 PS 4 PS 4 PS 4	IR IR TR TR TR TR TR TR TR TR	4 4 4 4 4 4 4 4 4 4	3,2,1 3,2,1 3 3 3 3 3 3 3 3			
2.13	Hot Air Blowing Equipment	a) Visual Examination b) Dimensions c) HV Test d) Test for quantity of air delivered & discharge pressure e) Temp. rise of outlet air f) Functional test (velocity and qty. of air etc.) g) Blower capacity h) Heater capacity	Major Major Major Major Major Major Major	Visual Measurement Electrical Testing Thermal Electro-mechanical Mechanical Electrical	100% 100% 100% 100% 100% 100% 100%	PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg	PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg PS / BHEL Drg	TR TR TR TR TR TR TR	4 4 4 4 4 4 4	3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1 3,2,1			
*) Type & routine test certificates for blower fans and motors													

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NPCL

 QUALITY ASSURANCE PLAN										GAP NO: RAPP-7&8/GAP/51130/01										REV: RO		DATE: 29.09.14							
ISOLATED PHASE BUS DUCT & ACCESSORIES										CLIENT: M/s NPCIL										EPC CONTRACTOR: M/s L&T									
PROJECT: 80TH PACKAGE RAPP 7&8										NPCIL PO NO.: CMW/MEO/23-40-2-1057/PO/6458/59										DATE: 03-12-2012									
SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS																
									P	W	R	H																	
2.14	Pressurisation Equipment	a) Raw materials	Major	Visual	1 Sample	BHEL Appd Drawing / OS	BHEL Appd Drawing / OS	TR	4		3,2,1		Witness at Equipment Manufacturer's Works.																
		b) Bought out items such as compressor valves, pipes, fittings, instruments, dryers etc	Major	Visual	100 %			TR	4		3,2,1																		
		c) Fabrication & Welding	Major	Visual	100 %			TR	4		3,2,1																		
		d) NDT on welds	Major	Visual	100 %			TR	4		3,2,1																		
		e) Pressure test	Major	Test	100%			TR	4	3,2,1																			
		f) Final inspection including visual, workmanship, dimensional, full functional verification of technical particulars, conformity to BOQ, painting etc.	Critical	Test	100%			TR	4	3,2,1																			
2.15	Hot Dip Galvanized Steel Structure	a) Visual & Dimensions	Major	Visual / Measurement	1 sample of each type	BHEL Appd Drawing / OS	BHEL Appd Drawing / OS	IR	4	3	2,1																		
		b) Galvanizing thickness	Major	Measurement				TR	4	3	2,1																		
		c) Mass of zinc coating	Major	Measurement				TR	4	3	2,1																		
		d) Adhesion / Precece test	Major	Physical				TR	4	3	2,1																		

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ISOLATED PHASE BUS DUCT & ACCESSORIES

REV: R0	DATE: 29.09.14
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558/59 DATE: 03-12-2012

SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
									P	W	R	H	
3.0	PROCESS INSPECTION												
3.1	a) Fabrication of Enclosure & Conductors	a) Marking	Major		100 %	BHEL Drg	BHEL Drg	IR	4.3				
		b) Shearing	Major	Visual/	100 %	BHEL Drg	BHEL Drg	IR	4.3				
		c) Edge forming	Major	Measurement	100 %	BHEL Drg	BHEL Drg	IR	4.3				
		d) Rolling	Major		100 %	BHEL Drg	BHEL Drg	IR	4.3				
		e) Dimensions	Major		100 %	BHEL Drg	BHEL Drg	IR	4.3				
		f) Welding Procedure & Qualifications :											
		g) Control of process	Critical	As indicated In WPS & PQR	100 %	App. WPS & PQR	App. WPS & PQR	TR	4.3				
		(ii) Welding preparation	Major	Visual	100 %	PS	PS	IR	4.3				
		(iii) Weld inspection	Major	Visual	100 %	PS	PS	IR	4.3				
		(iv) Dimensions	Major	Measurement	100 %	PS	PS	IR	4.3			2.1	
		(v) DP on finished weld	Major	Visual DP test	See Note-1	PS	PS	IR	4.3			2.1	
		(vi) mv drop test on straight butt joint on conductor	Major	Electrical	5% See Note-2	BS: 159 IS: 5561	BS: 159 IS: 5561	IR	3			2.1	
		(vii) Aluminium welding electrode	Major	Visual	100 %	PS	PS	TR	4			3	
		Note 1: DP Test shall be 100% for circumferential weld length (Enclosures & Busbar) and 10% for longitudinal weld lengths (Enclosures)											
		Note 2: Note-2: mv drop test shall be witnessed by 2/1 on 5% samples of offered lot at BHEL during final assembly inspection											
		Note 3: Welding of conductor shall be continuous in longitudinal direction.											
		Note 4: WPS & PQR shall be submitted for review											
3.2	a) Fabrication of PT & SP Cubicle/NG Cubicle/ pressurisation panel	a) Dimensions	Major	Measurement	100 %			IR	4			3	
		b) Visual check	Major	Visual	100 %			IR	4			3	
		c) Operation of moving parts	Major	Mechanical	100 %			IR	4			3	
		d) Assembly of Items	Major	Visual	100 %			IR	4			3	
		e) Electrical clearance	Major	Measurement	100 %	BHEL Appd Drg / Appd TDS	BHEL Appd Drg / Appd TDS	IR	4			3	
		f) Bus bar Mounting argmt.	Major	Mechanical	100 %			IR	4			3	
		g) Identification marking	Major	Physical	100 %			IR	4			3	


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ISOLATED PHASE BUS DUCT & ACCESSORIES

QAP NO: R-P-7&8/QAP/51130/01	REV: R0	DATE: 29.09.14
CLIENT: M/S INPCIL		
EPC CONTRACTOR: M/S L&T		
PROJECT: BOTI PACKAGE R&P 7&8		
INPCIL PO NO.: CNM/MEU/22-40-2-1067/PO/6456/59 DATE: 03-12-2012		

SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
									P	W	R	H	
	b) Cubicle wiring	a) Operation test	Major	Electrical	100 %			IR	4		3		
		b) Insulation Resistance	Major	Electrical	100 %			IR	4		3		
		c) Dielectric test	Major	Electrical	100 %			IR	4		3		
		d) Dimensions	Major	Measurement	5%			TR	4		3,2,1		
3.3	Fish plate / adaptor plate	b) Silver plating (if applicable)	Major	Measurement	2 samples/lot	BHEL Appd Drg	BHEL Appd Drg	TR	4		3,2,1		
3.4	Al metallic bellows / expansion joints	a) Dimensions	Major	Measurement	100%			TR	4		3,2,1		
		b) Surface finish	Major	Measurement	100%			TR	4		3,2,1		
		c) DP Test	Major	Visual	100%			TR	4		3,2,1		
		d) Measurement of mv drop for Al expansion joints	Major	Electrical	100%			TR	4		3,2,1		
3.5	Paint (Bus Bar & Enclosure)	a) Surface Preparation	Major	Visual	100 %			IR	3		2,1		
		b) Primer Coat	Major	Visual	100 %			IR	3		2,1		
		c) Under Coat	Major	Visual	100 %			IR	3		2,1		
		d) Finish Coat	Major	Dry film thickness	1 Sample	PS	PS	IR	3		2,1		
		e) Peel off test	Major	Physical	1 Sample							2,1	
Note: Painting procedure shall be submitted for approval													
4.0	FINAL INSPECTION												
4.1	Bus duct sections	Type tests											
		*a) Short time current test	Major	Electrical	1 Sample	IS : 8084	IS : 8084	TR	4		3,2,1		1
		*b) Impulse voltage withstand test	Major	Electrical	1 Sample	IS : 8084	IS : 8084	TR	4		3,2,1		1
		*c) Temp. rise test	Major	Electrical	1 Sample	IS : 8084	IS : 8084	TR	4		3,2,1		1
		d) Air tightness test	Major	Mechanical	1 Sample	IS : 8084	IS : 8084	TR	3		2,1		1
		e) Water tightness test	Major	Mechanical	1 Sample	IS : 8084	IS : 8084	TR	3		2,1		1
		Routine Tests											
		f) Dimensions	Major	Measurement				IR	3		2,1		1
		g) Surface finish	Major	Visual				IR	3		2,1		1
		h) Marking	Major	Visual				IR	3		2,1		1
	i) Paint Shade & thickness	Major	Visual				IR	3		2,1		1	
	j) Phase to Earth clearance	Major	Measurement										
Note-3: 10% of 1 sample (whichever is higher) of each BOM/Element Drawing shall be witnessed by 2/1													

NOTE-4

AGENCY CAPABILITY

BHEL Drg / Appd TDS

BHEL Drg / Appd TDS


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 Bimal Banerjee
 १ मन्त्र (प्रसाधन मन्त्र) के अन्तर्गत कार्य करने वाले अधिकारी
 दी. एच. ई. एल. लक्ष्मी
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QUALITY ASSURANCE PLAN													
ISOLATED PHASE BUS DUCT & ACCESSORIES													
QAP NO: RAPP-7&8/QAP/51130/01 REV: R0 DATE: 29.09.14 CLIENT: M/s NPCIL EPC CONTRACTOR: M/s L&T PROJECT: BOTI PACKAGE RAPP 7&8 NPCIL PO NO.: CMM/MEQ/22-40-2-1067/PO/6458/59 DATE: 03-12-2012													
SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS				REMARKS	
								AGENCY					
								P	W	R	H		
		k) Clamping tightness of insulators	Major	Physical				IR	3	2, 1			
		l) Electrical Tests :											
		i) HV Test	Major	Electrical	100 %	IS : 8084	IS : 8084	TR	3	2, 1			1
		ii) IR test	Major	Electrical	See Note-3	IS : 8084	IS : 8084	TR	3	2, 1			1
		Special tests											
		k) MV drop test on IPBD bolted joints at works (if any)	Major	Electrical	5%	BS: 159 IS: 5561	BS: 159 IS: 5561	TR	3	2, 1			1
		Note-4: Apart from air & water tightness tests, section wise details of type tests to be conducted on busduct is as follows. The type test will be conducted at CPRI Bhopal/ Gangjore (NPCIL Approved Lab)											
		Main Indoor - Temp. rise type test, Short circuit current test & impulse test Main Outdoor - Temp rise type test Delta - Temp rise type test Tap off - Short circuit current test For remaining sections/tests, similar reports shall be acceptable											
4.2	PT & SP/ NG Cubicle VT Cubicle / Pressurisation Control Panel	Routine Tests											
		a) Dimensions	Major	Measurement	100 %	App. Drg	App. Drg	IR	4	3,2,1			
		b) Surface finish	Major	Visual	100 %	App. Drg	App. Drg	IR	4	3,2,1			
		c) Phase identification marking	Major	Visual	100 %	App. Drg	App. Drg	IR	4	3,2,1			
		d) Electrical tests :											
		i) HV test	Major	Electrical	100 %	App. Drg	IS : 8084	TR	4	3,2,1			
		ii) IR test	Major	Electrical	100 %	App. Drg	IS : 8084	TR	4	3,2,1			
		iii) Continuity of Auxiliary wiring	Major	Electrical	100 %	App. Drg	IS : 8084	IR	4	3,2,1			
		iv) HV & IR test on Aux. Items	Major	Electrical	100 %	App. Drg	IS : 8084	IR	4	3,2,1			
		e) Schematic check of wiring	Major	Electrical	100 %	App. Drg	App. Drg	IR	4	3,2,1			
		f) Verification of BOM	Major	Visual	100 %	App. Drg	App. Drg	IR	4	3,2,1			
		g) Degree of Protection	Major	Mechanical	1 Sample	App. Drg	App. Drg	IR	4	3,2,1			
		h) Paint thickness	Major	Measurement	100%	App. Drg	App. Drg	IR	4	3,2,1			
		Note: Valid type test certificate for "u" marked characteristics shall be furnished to NPCIL for their acceptance. If valid type test certificate are not available, sub-vendor will carry out type testing in presence of NPCIL QS Engineer.											

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QUALITY ASSURANCE PLAN		ISOLATED PHASE BUS DUCT & ACCESSORIES											
SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
									P	W	R	H	
5.0 FINAL DOCUMENTATION / SHIPPING RELEASE / HISTORY DOCKET													
5.1	Verification of spares	Visual, Dimension & all test as required by spec.	Minor	Visual/ Dimension	100%	App. Dtg.	App. Dtg.	IR	3	2	1		Note-12
5.2	Verification of Final documents & stamping	Verification of inspection documents	Critical	Verification of Completeness	100%	Applicable Format	Applicable Format	Insp. & Test Report	3	2	1		
5.3	Inspection Release note	Completion of PO & QAP	Major	Review of documents	100%	Contract Document	Contract Document	Inspection on Release note	2		1		
5.4	Shipping Release	Completion of PO & QAP and DODSAL INM	Major	Review of documents	100%	Contract Document	Contract Document	Shipping release	1			1	
5.5	History Documents	Verification of inspection & test documents and history docket	Critical	Verification of Completeness	100%	Approved Formats	Approved Formats	Docket	3		2, 1		Note-First copy to be approved by NPCL-QS
5.6	Packing	Protection verify	Major	Visual	100%	-	Manufactures procedure	-	3	2	1		


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 2 years (from 1st meeting to 2nd meeting) as Manager (Quality & Logistics)
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		QUALITY ASSURANCE PLAN					QAP NO: RAPP-7&8/QAP/51130/01		REV: 00		DATE: 29.09.14	
		ISOLATED PHASE BUS DUCT & ACCESSORIES					CLIENT: M/S NPCL		EPC CONTRACTOR: M/S L&T		PROJECT: BOTI PACKAGE RAPP 7&8	
SL. COMPONENT NO.		CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	P		W	
									R		H	
											REMARKS	

ABBREVIATIONS:

R= REVIEWED BY
 P= PERFORMED BY
 W= WITNESS BY (AFTER LAPSE OF DUE NOTICE TO NPCL, MANUFACTURER MAY PROCEED WITH MANUFACTURING / NEXT STAGE)
 H= HOLD (UNLESS A WRITTEN CLEARANCE IS OBTAINED FROM NPCL, MANUFACTURER SHALL NOT PROCEED TO NEXT STAGE)

IR= INSPECTION REPORT
 TR= TEST REPORT/CERTIFICATE
 TDS= TECHNICAL DATA SHEET
 APPD DRG= APPROVED DRAWING
 PS= PLANT STANDARD

IS= INDIAN STANDARD
 IEC= INTERNATIONAL ELECTRO TECHNICAL COMMISSION STANDARD
 IEEE= INSTITUTE OF ELECTRONICS & ELECTRICAL ENGINEERS STANDARD

1= NPC-QS
 2= L&T-QS
 3= BHEL
 4= BHEL SUB-VENDOR / NABL APPROVED EXTERNAL LABORATORY

NOTES

- WHERE EVER R & W ARE BOTH MENTIONED, NPCL QS / L&T QS TO WITNESS TEST OR REVIEW TRS
- TRS NOT MORE THAN FIVE YEARS OLD FROM DATE OF PURCHASE ORDER SHALL BE REVIEWED FOR ACCEPTANCE OTHERWISE SUB-VENDOR WILL CARRY OUT TYPE TEST
- MINOR : THE CHARACTERISTICS OF A COMPOUND, PROCESS OR OPERATIONS WHOSE FAILURE NEITHER MATERIALLY REDUCE USABILITY OF THE PRODUCT IN OPERATION, NOR DOES IT AFFECT THE AESTHETIC ASPECTS

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ISOLATED PHASE BUS DUCT & ACCESSORIES

												
SL. COMPONENT NO.	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	QUALITY ASSURANCE PLAN				
								ISOLATED PHASE BUS DUCT & ACCESSORIES				
								QAP NO: RAPP-788/QAP/51130/01				
								CLIENT: M/S NPCL				
								EPC CONTRACTOR: M/S L&T				
PROJECT: BOTT PACKAGE RAPP 788								REV: R0				
NPCL PO NO: CMM/MEC/22-40-2-1067 /PO/6659/59								DATE: 29.09.14				
DATE: 09-12-2012												
SL. COMPONENT NO.	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
								P	W	R	H	

- 4 MAJOR : THE CHARACTERISTICS OF A COMPOUND , PROCESS OR OPERATIONS WHOSE FAILURE MAY CAUSE OPERATION FAILURE WHICH CAN NOT BE READILY CORRECTED AT SITE OR CAUSE SUBSTANDARD PERFORMANCE , INCREASE EJECTION OR MAINTENANCE , REDUCE LIFE OR SERIOUSLY AFFECT AESTHETICS OR AGRONOMICS
- 5 CRITICAL : THE CHARACTERISTICS OF A COMPOUND , PROCESS OR OPERATIONS WHOSE FAILURE WILL SURELY CAUSE OPERATION FAILURE OR INTERMITTENT TROUBLES WHICH IS DIFFICULT TO RECTIFY AT SITE OR RENDER THE UNIT FOR USE
- 6 "FAILURE" OF A CHARACTERISTIC MEANS FAILURE TO MEET "ACCEPTANCE NORMS"
- 7 SAMPLING: GENERALLY IN ACCORDANCE WITH IS 2500
IF 100% WITNESS IS CARRIED OUT BY "PRIME CONTRACTOR (I&T)", NPCL WILL WITNESS ON SAMPLE BASIS, OR IF 100% WITNESS OF TESTS IS CARRIED OUT BY "SUB-CONTRACTOR (BHEL)", "PRIME CONTRACTOR" WILL WITNESS ON SAMPLE BASIS
- 8 ALL TESTING INSTRUMENTS SHOULD BE CALIBRATED BEFORE WITNESSING THE TEST & CALIBRATED INSTRUMENTS SHALL BE USED DURING INSPECTION, EXAMINATION & TESTING.
- 9 REFERENCE DOCUMENT / ACCEPTANCE NORMS SHALL BE AS PER NPCL APPROVED DRG / DATASHEET / SPECIFICATION.
- 10 NDE IS TO BE CARRIED OUT OVER 8Y ISWT / ASNT LEVEL-II QUALIFIED PERSONNEL.
- 11 ALL TESTING SHALL BE CARRIED OUT AT NPCL / NABL APPROVED LABORATORIES.
- 12 SPARES SHALL UNDERGO SAME INSPECTION / TESTING REQUIREMENTS AS THE ORIGINAL ITEMS

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