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		QUALITY ASSURANCE PLAN		QAP No.	RAPP-7&8/QAP/51130/01																																				
		ISOLATED PHASE BUS DUCT & ACCESSORIES		Rev No.	RO																																				
Project : RAJASTHAN ATOMIC POWER PROJECT - 7/8		Package : ISOLATED PHASE BUS DUCT & ACCESSORIES		Date	29.09.2014																																				
PACKAGE CONTRACTOR Larsen & Toubro Limited Pankaj Building, Opp. GEB Substation NH No. 8, Chandel Vadodara-391740, Gujarat		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 <table border="1"> <tr> <td>Checked by</td> <td>Reviewed by</td> <td>Approved by</td> </tr> <tr> <td><i>Sanjay Pandey</i> (E. At.) Signature</td> <td><i>[Signature]</i> Signature</td> <td><i>[Signature]</i> Signature</td> </tr> </table>				Checked by	Reviewed by	Approved by	<i>Sanjay Pandey</i> (E. At.) Signature	<i>[Signature]</i> Signature	<i>[Signature]</i> Signature																														
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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/S 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		WORK ORDER NUMBER : NA																																							
Q.A. Ref No : 2131469 Data Sheet for Isolated Phase Bus Duct Item : ISOLATED PHASE BUS DUCT & ACCESSORIES		<table border="1"> <tr> <td colspan="2">L&T QAP No. :</td> <td colspan="2">RAPP-7&8/QAP/51130/01</td> </tr> <tr> <td colspan="2">DESIGN CODE</td> <td colspan="2">IS 8084, IEEE C37.23</td> </tr> </table>				L&T QAP No. :		RAPP-7&8/QAP/51130/01		DESIGN CODE		IS 8084, IEEE C37.23																													
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(Approved on behalf of project unit.)

QUALITY ASSURANCE PLAN									
ISOLATED PHASE BUS DUCT & ACCESSORIES									
QAP NO: RAP-788/QAP/51130/01		CLIENT: M/S NPCIL		EPC CONTRACTOR: M/S L&T		PROJECT: BOTI PACKAGE RAP 788		REV: NO	
NPCL PO NO: CNM/M60/22-40-2-1067/PO/6458/59		DATE: 09-12-2012		APPROVED BY		APPROVED BY		APPROVED BY	
SL. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	REMARKS
1.0	RAW MATERIAL								
1.1	Aluminium Sheets for Main and Tap-off bus duct enclosures, 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	1 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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ISOLATED PHASE BUS DUCT & ACCESSORIES

INPCL PO NO.: CMM/MEO/22-40-2-1067/PO/645B/59 DATE: 09-12-2014

Sl. NO.	COMPONENT	CHARACTERISTICS	CATEGORY	METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS
									AGENCY				
									P	W	R	H	
1.5	Steel Structure [SMB/SMC/ISA]	a) Dimensions b) Surface finish c) Bend Test d) Chemical composition	Major Major Major Major	Measurement Visual Mechanical Chemical	10 % 100 % 1 sample/lot 1 sample/lot	Appd TDS / Drg PS IS : 2062 IS : 2062	Appd TDS / Drg PS IS : 2062 IS : 2062	IR IR TR TR	4 4 4 4	3,2,1 3,2,1 3,2,1 3,2,1			
2.0	BOUGHT/OUT ITEMS	Acceptance / Routine Tests											
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) Lighting Impulse voltage withstand h) Water absorption test i) Flammability test	Major Major Major Major Major Major Major Major Major	Physical Physical Measurement Electrical Electrical Electrical Electrical Physical Electrical	100 % 10% 100 % 100 % 1 Sample 1 Sample 1 Sample 1 Sample 1 Sample	PS BHEL Drg / TDS BHEL Drg / TDS IS:2099/IS:9431 IS:2099/IS:9431 IS:2099/IS:9431 IS:2099/IS:9431 IS:2099/IS:9431 IS:2099/IS:9431	PS BHEL Drg / TDS BHEL Drg / TDS IS:2099/IS:9431 IS:2099/IS:9431 IS:2099/IS:9431 IS:2099/IS:9431 IS:2099/IS:9431	IR IR IR TR TR TR TR TR	4 4 4 4 4 4 4 4 4	3 3 3 3 3 3 3 3 3	2,1 2,1 2,1 2,1 2,1 2,1 2,1 2,1 2,1		
2.2	Insulators (Porcelain)	a) Visual Tests 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 accented	Major Major Major Major Major Major Major Major Major Major	Visual Measurement Measurement Electrical Electrical Thermal Mechanical Physical 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 Drg / TDS BHEL Drg / TDS IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544	PS BHEL Drg / TDS BHEL Drg / TDS IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544 IS: 2544	IR IR TR TR TR TR TR TR TR TR	4,3 4,3 4,3 4 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 "i" 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.													
Witness by 2,1 shall be done during final busduct assembly inspection at BHEL													

Animal Sanctioned
प्रिनस नवार्वा
 APPROVED BY  **Dr. Anwar Hussain**
 BHEL, Rourkela
 BHEL
 रौरकेला-769015
 Udaipur-727001

APPROVED BY
L. T.
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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/MED/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	Major	Visual	100 %	BHEL Appd Drg	BHEL Appd Drg	TR	4	3,2,1			1	Witness of 1 sample of each type/rating by Manufacturer's Works.	
		b) Dimensions	Major	Measurement	100 %	BHEL Appd Drg	BHEL Appd Drg	TR	4	3,2,1			1		
		c) Verification of terminal marking and polarity	Major	Electrical	100 %	BHEL Appd Drg	BHEL Appd Drg	TR	4	3,2,1			1		
		d) PF Voltage test on primary & sec winding	Major	Electrical	100 %	IS: 3156	IS: 3156	TR	4	3,2,1			1		
		e) Partial discharge test	Major	Electrical	100 %	IS: 3156	IS: 3156	TR	4	3,2,1			1		
		f) Determination of errors	Major	Electrical	100 %	IS: 3156	IS: 3156	TR	4	3,2,1			1		
		g) HV/PF Voltage test on secondary winding & between section	Critical	Electrical	100 %	IS: 3156	IS: 3156	TR	4	3,2,1			1		
		*Type Tests													
		h) Heat run test	Critical	Electrical	1 Sample	IS: 3156	IS: 3156	TR	4						1
		i) Impulse voltage with stand test	Critical	Electrical	1 Sample	IS: 3156	IS: 3156	TR	4						1
		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.													
2.4	Current Transformer	Routine Tests/ Acceptance test													
		a) Visual Examination	Major	Visual	100 %	BHEL Appd Drg	BHEL Appd Drg	TR	4	3,2,1			1	Witness of 1 sample of each type/rating by Manufacturer's Works.	
		b) Dimensions	Major	Measurement	100 %	BHEL Appd Drg	BHEL Appd Drg	TR	4	3,2,1			1		
		c) Verification of terminal marking and polarity	Major	Electrical	1 Sample	BHEL Appd Drg	BHEL Appd Drg	TR	4	3,2,1			1		
		d) PF Voltage test on secondary winding & between section	Critical	Electrical	1 Sample	IS: 2705	IS: 2705	TR	4	3,2,1			1		
		e) Over Voltage Inter - turn test	Major	Electrical	100 %	IS: 2705	IS: 2705	TR	4	3,2,1			1		
		f) Determination of errors according to the requirement of appropriate accuracy class	Major	Electrical	100 %	IS: 2705	IS: 2705	TR	4	3,2,1			1		
		g) Partial discharge test	Major	Electrical	100 %	IS: 2705	IS: 2705	TR	4	3,2,1			1		
		h) PF Voltage test on primary winding	Major	Electrical	100 %	IS: 2705	IS: 2705	TR	4	3,2,1			1		
		*Type Tests													
		i) Impulse with stand test	Major	Electrical	1 Sample	IS: 2705	IS: 2705	TR	4						1
		j) Temperature rise test	Major	Electrical	1 Sample	IS: 2705	IS: 2705	TR	4						1

APPROVED BY: BHEL, Rourkela
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APPROVED BY: L T
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As per the order
 is complete before
 starting regular production

QUALITY ASSURANCE PLAN													
ISOLATED PHASE BUS DUCT & ACCESSORIES													
OAP NO: RAPP-7&8/OAP/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: 03-12-2012													
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
2.6	Neutral Grounding Transformer	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.											
		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 manufacturer Works.													

APPROVED BY:  Binai Banerjee
 Director (Quality & Safety)
 BHEL, Rourkela
 BHEL
 Reference - 203153 Uthmaniyah-203153



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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 Apd Drg	BHEL Apd Drg	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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										QUALITY ASSURANCE PLAN									
ISOLATED PHASE BUS DUCT & ACCESSORIES										QAP NO: RAPP-788/QAP/51130/01 REV: 00 DATE: 29.09.14									
EPC CONTRACTOR: M/s L&T										CLIENT: M/s NPCIL									
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NPCIL PO NO.: CMM/MEQ/23-40-2-1067/PO/6458/59 DATE: 08-12-2012										PROJECT: BOTI PACKAGE RAPP 788									
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				Major	Electrical	100 %	IS : 11548	IS : 11548	TR	P	W	R	H				
		j) Sealing test				Major	Visual	100 %	IS : 11548	IS : 11548	TR	4	3	2,1	1				
		*Type Tests																	
		k) Short circuit discharge test				Major	Electrical	1 Sample	IS : 11548	IS : 11548	TR	4		3,2,1					
		l) Partial discharge test				Major	Electrical	1 Sample	IS : 11548	IS : 11548	TR	4		3,2,1					
		m) Thermal stability test				Major	Electrical	1 Sample	IS : 11548	IS : 11548	TR	4		3,2,1					
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.																			
2.9	HT Fuse	a) Visual	Major	Visual	100 %	PS	PS	IR	3,4	2,1									
		b) Type & rating	Major	Visual	100 %	IEC 60282-1	IEC 60282-1	IR	4	3,2,1									
		c) Resistance / conductivity	Major	Electrical	1 Sample	PS	PS	TR	4	3,2,1									
		d) Dimensions	Major	Measurement	100 %			TR	4	3	2,1								
		e) Visual finish	Major	Visual	100 %			TR	4	3	2,1								
		f) Surface finish	Major	Visual	100 %			TR	4	3	2,1								
		g) Insulation resistance test	Major	Electrical	1 Sample			TR	4	3	2,1								
		h) Shore Hardness (Shore-A)	Major	Mechanical	1 Sample			TR	4	3,2,1									
		i) Flame Test	Major	Electrical	1 Sample			TR	4	3,2,1									
		j) Ageing Test	Major	Mechanical	1 Sample			TR	4	3,2,1									
		k) Compression & recovery test for bellows	Major	Measurement	1 Sample			TR	4	3	2,1								
		l) % Elongation & Tensile strength	Major	Mechanical	1 Sample			TR	4	3,2,1									
2.10	Rubber Bellows and gaskets	BHEL Appd Dirg / Appd TDS																	
		BHEL Appd Dirg / Appd TDS																	
		Witness at Equipment Manufacturer's Works or test laboratory																	

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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	Major	Visual	100%	PS / BHEL Drg	PS / BHEL Drg	IR	4/3				
		b) Dimensions	Major	Measurement	2% per lot	PS / BHEL Drg	PS / BHEL Drg	IR	4/3				
		c) Chemical & Mechanical tests (for SS only)	Major	Chem. & Mech.	1 sample/lot	PS / BHEL Drg	PS / BHEL Drg	TR	4			3,2,1	
		d) Surface coating (for MS only)	Major	Visual	1 sample/lot	PS / BHEL Drg	PS / BHEL Drg	TR	4			3,2,1	
		e) Property Class (for MS only)	Major	Visual	1 sample/lot	PS / BHEL Drg	PS / BHEL Drg	TR	4			3,2,1	
2.12	Paint	Routine Tests											
		a) Shade	Major	Visual	100 %	Appd TDS / Drg	Appd TDS / Drg	IR	4	3,2,1	3		
		b) Consistency	Major	Visual	100 %	IS : 5	IS : 5	IR	4	3,2,1	3		
		Acceptance Tests											
		c) Flash Point test	Major	Thermal	1 Sample	PS 4	PS 4	TR	4			3	
		d) Drying Time	Major	Measurement	1 Sample	PS 4	PS 4	TR	4			3	
		e) Adhesion & Flexibility	Major	Measurement	1 Sample	PS 4	PS 4	TR	4			3	
		f) Scratch Hardness	Major	Measurement	1 Sample	PS 4	PS 4	TR	4			3	
		g) Viscosity	Major	Measurement	1 Sample	PS 4	PS 4	TR	4			3	
		h) Specific gravity	Major	Measurement	1 Sample	PS 4	PS 4	TR	4			3	
		i) Corrosion resistance	Major	Measurement	1 Sample	PS 4	PS 4	TR	4			3	
		j) Wet opacity	Major	Measurement	1 Sample	PS 4	PS 4	TR	4			3	
		a) Visual Examination	Major	Visual	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4	3,2,1			
		b) Dimensions	Major	Measurement	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4	3,2,1			
		c) HV Test	Major	Electrical	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4	3,2,1			
2.13	Hot Air Blowing Equipment	d) Test for quantity of air delivered & discharge pressure	Major	Testing	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4	3,2,1		1	
		e) Temp. rise of outlet air	Major	Thermal	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4	3,2,1			
		f) Functional test (velocity and qty. of air etc.)	Major	Electro-mechanical	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4			3,2,1	
		g) Blower capacity	Major	Mechanical	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4			3,2,1	
		h) Heater capacity	Major	Electrical	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4			3,2,1	
		*i) Type & routine test certificates for blower fans and motors	Major	Mechanical & electrical	100%	PS / BHEL Drg	PS / BHEL Drg	TR	4			3,2,1	

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		QUALITY ASSURANCE PLAN										GAP NO: RAPP-7&8/GAP/51130/01		REV: RO		DATE: 29.09.14							
ISOLATED PHASE BUS DUCT & ACCESSORIES		EPC CONTRACTOR: M/s L&T										PROJECT: BOTI PACKAGE RAPP 7&8 NPCIL PO NO.: CMW/MEO/23-40-2-1057/PO/6458/59 DATE: 03-12-2012											
		CLIENT: M/s NPCIL																					
SL. NO.		COMPONENT		CHARACTERISTICS		CATEGORY		METHOD OF CHECK		EXTENT OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORMS		FORMAT OF RECORDS				AGENCY		REMARKS	
2.14		Pressurisation Equipment		a) Raw materials b) Bought out items such as compressor valves, pipes, fittings, instruments, dryers etc		Major		Visual		1 Sample						TR		4		3,2,1			
						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 %		BHEL Appd Drawing / DS		BHEL Appd Drawing / DS		TR		4		3,2,1		Witness at Equipment Manufacturer's Works.	
				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 / DS		BHEL Appd Drawing / DS		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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EPC CONTRACTOR: M/S L&T

PROJECT: BOTN PACKAGE RAPP 78&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	AGENCY				REMARKS
									P	W	R	H	
3.0	PROCESS INSPECTION												
3.1	Fabrication of Enclosure & Conductors	a) Marking b) Sheathing c) Edge forming d) Rolling e) Dimensions f) Welding Procedure & Qualifications : g) Control of process h) Welding preparation i) Weld inspection j) Dimensions k) DP on finished weld l) mV drop test on straight butt joint on conductor m) Aluminum welding electrode	Major Major Major Major Major Critical Major Major Major Major Major Major	Visual/ Measurement As indicated in WPS & PQR Visual Visual Measurement Visible DP test Electrical Visual	100 % 100 % 100 % 100 % 100 % 100 %	BHEL Drg BHEL Drg BHEL Drg BHEL Drg BHEL Drg App. WPS & PQR PS PS PS PS See Note-1 BS: 159 IS: 5561 PS	BHEL Drg BHEL Drg BHEL Drg BHEL Drg BHEL Drg App. WPS & PQR PS PS PS PS PS BS: 159 IS: 5561 PS	IR IR IR IR IR TR	4,3 4,3 4,3 4,3 4,3 4,3				
Note 1:	DP Test shall be 100% for circumferential weld length (Enclosures & Busbar) and 10% for longitudinal weld lengths (Enclosures)												
Note 2:	mV drop test shall be witnessed by 2/3 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	Fabrication of PT & SP Cubicle/NG Cubicle/presentation panel	a) Dimensions b) Visual check c) Operation of moving parts d) Assembly of items e) Electrical clearance f) Bus bar Mounting arrang. g) Identification marking	Major Major Major Major Major Major Major	Measurement Visual Mechanical Visual Measurement Mechanical Physical	100 % 100 % 100 % 100 % 100 % 100 % 100 %	BHEL Appd Drg / Appd TDS	BHEL Appd Drg / Appd TDS	IR IR IR IR IR IR IR	4 4 4 4 4 4 4	3 3 3 3 3 3 3			

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 **बिनोद बारज्यो**
Binod Bararjee
A. K. Bararjee (Joint & Co.) for Manager (Quality & Vigilance)
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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		
3.2	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				
3.3	Fish plate / adpater plate	a) Dimensions	Major	Measurement	5%	BHEL Appd Drg	BHEL Appd Drg	TR	4					
		b) Silver plating (if applicable)	Major	Measurement	2 samples/lot			TR	4	3,2,1				
3.4	AI metallic bellows / expansion joints	a) Dimensions	Major	Measurement	100%	BHEL Appd Drg	BHEL Appd Drg	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 AI expansion joints	Major	Electrical	100%			TR	4	3,2,1				
3.5	Paint (Bus Bar & Enclosure)	a) Surface Preparation	Major	Visual	100 %	PS	PS	IR	3		2,1			
		b) Primer Coat	Major	Visual	100 %			TR	3		2,1			
		c) Under Coat	Major	Visual	100 %			IR	3		2,1			
		d) Finish Coat	Major	Dry film thickness	1 Sample			IR	3	2,1				
		e) Peel off test	Major	Physical	1 Sample				3		2,1			
Note: Painting procedure shall be submitted for approval														
4.0	FINAL INSPECTION													
4.1	Bus duct sections	Type tests	Major	Electrical	1 Sample	IS : 8084	IS : 8084	TR	4	3,2,1		1	Note-3: 10% or 1 sample (whichever is higher) of each BOM/Element Drawing shall be witnessed by Z/1	
		*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 Shide & thickness	Major	Visual					IR	3	2,1			1
		j) Phase to Earth clearance	Major	Measurement					IR	3	2,1			1
NOTE-4														

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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	AGENCY				REMARKS
									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 Bhopali/ 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											
		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	Inspect on Release note	2		1		
5.4	Shipping Release	Completion of PO & QAP and DODSAL INI	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		


 विपिन वर्मा Binod Banerjee
 2 years (from 1st meeting to 1st meeting) at Bangalore (during 6 Visits)
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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

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 ELECTION ON MAINTENANCE, REDUCE LIFE OR SERIOUSLY AFFECT AESTHETICS OR AGRONOMICS

6 "FAILURE" OF A CHARACTERISTIC MEANS FAILURE TO MEET 'ACCEPTANCE NORMS

SAMPLING: GENERALLY IN ACCORDANCE WITH IS 2500

7 IF 100% WITNESS IS CARRIED OUT BY PRIME CONTRACTOR (LAT), N/CIL WILL WITNESS ON SAME BASIS, OR IF 100% WITNESS OF TESTS IS CARRIED OUT BY SUB-CONTRACTOR (BHEL), PRIME CONTRACTOR WILL WITNESS ON SAME 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 NPCIL APPROVED DRG / DATASHEET / SPECIFICATION.

10 NDE IS TO BE CARRIED OUT OVER 8Y ISNT / ASNT LEVEL-II QUALIFIED PERSONNEL

21 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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