



BIHAR STATE POWER TRANSMISSION COMPANY LIMITED

MANUFACTURING QUALITY PLAN -- VRLA BATTERY

MANUFACTURER:		CUSTOMER:		VENDOR'S CODE		ITEM:	M.Q.P. NO.:	002		Valid From:	15.01.2016
		BSPTCL				BATTERY CHARGER				Valid Upto:	Till Revision
						DATE :	02.01.2016		Page- 1 of 5		
Process/ Section	Machine/ Tool	Product	Parameter	Specification/ Identification	Test method/Instrument/ Identification	Sample		Record	Action to be taken in case of Non-confirmity		
						Qty/Nos	Frequency	Person Responsible Production/QC		Production /Quality	
Grid Casting	Grid Casting machine	Positive Grid	Ca% in Pot alloy	0.07 to 0.10%	OES	Min. 100g/ pot	Every Day	Supervisor/ Operator	Recorded in Register	Inform to Production/ QC Incharge for necessary action.	
			Sn% in Pot alloy	1.3 to 1.5%							
		Negative Grid	Ca% in Pot alloy	0.13 to 0.18%	Inbuilt controller	1	Set up approval & every 1hr of run time	Supervisor/ Operator	VRLA/BSPTC L/002	If any problems inform to Production / QC Incharge	
			Pot temp	495 ± 15°C							
		-	Feedline temp.	495 ± 15°C							
		-	Laddle temp.	500 ± 15°C							
		-	Mould top temperature	120 to 200°C							
		-	Mould bottom temperature	120 to 200°C							
		Cork powder	---	Binderless cork solution	Visual	-	Every Batch	Supervisor/ Operator			
		Cork solution shelf life	----	No of days	2 Days	Once	Every Mix	Supervisor/ Operator		If any problems inform to Production / QC Incharge	
		Positive/ Negative grid	Grid Weight	Annexure-I	Weighing Balance	3	Every 1hr of run time	Supervisor/ Operator		If any problems inform to Production / QC Incharge	
			Grid Thickness & Grid Width	Annexure-I	Vernier callipers	3	Every One Hr	Supervisor/ Operator		Re-melting	
		Grid	Cracks	Not Allowed	Visual Inspection	5	Set up approval & every 1hr of run time	Supervisor/ Operator	VRLA/BSPTC L/002	Re-melting	
			Blow Holes	Not Allowed							
Pin Holes	Max - 4										
Flash	Not Allowed										
Shortruns	Max - 2										
Frame Cuts	Not Allowed										
Ball Mill	Ball Mill	Pot Temp	390 ± 10°C	In built	-	Every One Hr	Supervisor/ Inspector	VRLA/BSPTC L/002	Inform to Production/ QC Incharge		
		Cutting Freq of Lead cubes	40 ± 5 Hz	In built	-						
		Negative Pressure	300 ± 30 mm of H ₂ O	In built	-						
		Positive Pressure	725 ± 30 mm of H ₂ O	In built	-						
		Ball Mill Temp.	Front : 145 ± 10°C Middle : 145± 10°C Rear : 145 ± 10°C	In built	One	Every 1 hr	Supervisor/ Inspector				
		Lead Cube Wt	120 ± 30 gm	In built	One	Every 1 hr	Supervisor/ Operator				
		Angle of Air Pressure	37°	In built	-	Every 1hr	Supervisor/ Inspector				
		Inlet Air Pressure	0.5 Mpa	In built	-						
		Inlet Water Pressure	0.2 Mpa	In built	-						
		Bag house Temp.	Max 120°C	In built	-						
		Lead Sub Oxide	Density of Oxide	1.0 -1.10 g/cc	Scott Volumeter	-	Every 1 hr			Supervisor/ Operator	
Lead Sub Oxide	Free Lead	28-32 %	Chemical Analysis		Every 1 hr						
Ion Exchange process	DI Water plant	DI Water	Conductivity	< 10 µS	Conductivity meter	300 ml	Once in a day	Supervisor/ Operator	Recorded in Register	Inform to ETP incharge	
			Iron	< 10 ppm	Wet Analysis						
			p ^H	7±0.5	p ^H Meter						
			Chlorides	< 10.0 ppm	Wet Analysis						
Acid dilution plant	Diluted acid	Acid	Specific Gravity @ 27°C	1.4 ± 0.005 (paste mixing) 1.1 ± 0.005 (pickling) 1.255 & 1.27 ± 0.005 (Acid filling)	Hydrometer/Density Bottle method	300 ml	Once in every batch	Supervisor/ Operator		Correct the Specific Gravity by adding Acid / DI water.	



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Paste Mixing	Paste Mixer	Positive Paste Mixing										
		Lead Sub Oxide	Weight of additives	750 ± 2 kg	Inbuilt Load Cell	Once	Every Batch	Operator/ Supervisor	VRLA/BSPTC L/002	Inform maintenance ,correct the load cell.		
		Red Lead		123 ± 1 kg	Weighing balance					Inform to maintenance and correct the weigh ing balance		
		Dynel fibre		855 ± 5 gm								
		SCMC		1350 ± 5 gm								
		DI Water		118 ± 1kg	Inbuilt Load Cell					Inform to maintenance and correct the load cell.		
		Sulphuric Acid (1.4 ± 0.005)		94 ± 1 kg								
		Negative paste Mixing										
		Lead Sub Oxide	Weight of additives	900 ± 2 kg	Inbuilt Load Cell	Once	Every Batch	Operator/ Supervisor	VRLA/BSPTC L/002	Inform to maintenance and correct the load cell.		
		Dynel fibre		855 ±5 gm	Digital weighing balance					Inform to maintenance and correct the weigh ing balance		
		Barium Sulphate		4200 ± 5 gm								
		Carbon black		1350 ± 5 gm								
		Lignin		1800 ± 5 gm	Inbuilt Load Cell					Inform to maintenance and correct the load cell.		
		DI Water		110 ± 1 kg								
		Sulphuric Acid (1.4 ± 0.005)	94 ± 1 kg									
		-	Oxide Feeding	3 to 4 Mins	In built timer	Once	Every batch	Operator/ Supervisor	VRLA/BSPTC L/002	Inform to Production / Quality Incharge		
		-	Dry Mix Time	3 to 4 Mins								
		-	Water feeding	3 to 4 Mins								
		-	Wet Mix Time	3 to 4 Mins								
		-	Acid Feeding	15 Minutes Max								
-	Final Mix	15 Minutes Max										
-	Peak Temp	68° C	In built Temp controller	Once								
-	Mix end Temp	45°C Max										
Paste	Paste	Paste Density										
		Positive	4.25 ± 0.05 gm/cc	Density cup method	Once	Every batch	Operator/ Supervisor	VRLA/BSPTC L/002	Inform to Production / Quality Incharge			
		Negative	4.45 ± 0.05 gm/cc									
		Moisture	10-12 %	Chemical Analysis	Once	Once in a day/Type	Recorded in Register					
		Iron	< 30 ppm			Once in a week						
Pasting	Pasting Machine	Positive/ Negative Plate	Plate Weight	Annexure-I	Digital weighing balance	5	Every hr	Operator/ Supervisor	VRLA/BSPTC L/002	In case of over weight remove paste from plate and reject grid. In case of low weight refeed the plate for repasting immediately without loss of moisture		
			Plate Thickness	Annexure-I	Thickness guage	5	Every hr	Operator/ Supervisor		Change the settings of hooper to attain exact thickness		
		-	Pellet drop	2 Pellet drops allowed scattered,shall not be on top 5 lines	Visual Inspection	100%	Every batch/Hour	Operator/ Supervisor	VRLA/BSPTC L/002	Reject		
		-	Lumps	Not Allowed								
		-	Distortion	Not Allowed								
		-	Unfills	Not Allowed								
		Paste consumption time		within 2 hrs		Clock	once	Every skid	Operator/ Supervisor	Recorded in Register	Inform to Quality Incharge	
		Loading of skids into curing chambers		Within 20 minutes								

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						Qty/Nos	Frequency	Person Responsible	Prod.			
								Production/QC				
Curing & Drying of pasted plates	Curing & Drying Chambers	Plates	Temp curing chamber	55 ± 5°C	Temperature controller	Once	Every Hour	Operator/ Supervisor	VRLA/BSPTC L/002	Inform to Quality Incharge		
			RH %	95±5								
			Time of curing	24 ± 1 hr	Clock							
			Temp.drying chamber	55 ± 5°C	Temp. controller							
					Time of drying	11 ± 1 hr	Clock	Once	Every Hour	Operator/ Supervisor		Extend drying based on moisture content
				Plates	Free Lead	Pos. < 3 %	Chemical Analysis	Once	Every Batch	Operator/ Supervisor	Recorded in Register	Inform to QC incharge for further action
					Moisture	Neg. < 5 %						
				Active Material loss(Drop test)	Active Material Loss	< 25 %	Weighing Machine	2	Every Batch	Operator/ Supervisor	Recorded in Register	Inform to QC incharge for further action
		Cured & Dried plates	Pellet drop		<=3 pellets scattered,shall not be on top 5 lines	Visual Inspection	100%	Every Batch	Operator	-----	Reject the plates and inform to the QC incharge for further action	
				Rust marks/Distortion/ Lumps/Flaking	Not allowed							
Fluxing & Tinning	Flux & Tin baths	Tinned Brass Inserts	~up to 24 mm dia from bottom of pillar	A thin layer of uniform Tin layer	Visual	100%	Every hr	Operator	-----	Inform to Quality Incharge		
PillarCasting	Pillar casting M/C	Pillars	Pot Temp	460 ± 20°C	Digital Controller	100%	Every Shift	Supervisor/operator	VRLA/BSPTC L/002	Remelt the pillars in that particular shift, if the visual parameters are not met.		
			Mould Temp	130 ± 20°C	Digital Controller							
			Blow holes	Not Allowed	Visual Inspection							
			Shrinkage	Not Allowed								
			Unfills	Not Allowed								
			Cracks	Not Allowed								
		Pillar aging time	Min 24 hrs	Clock	Every Shift	100%	Supervisor/operator	Recorded in Register	Make sure the pillars were sent to Assembly section after the specified time			
Buffing	Buffing Machine	(+Ve) and (-Ve) Plates	Lug Finish & Sides of the plates	Shall be free from oxide layer	Visual	100%	Every batch	Supervisor/operator	VRLA/BSPTC L/002	Rework		
Wrapping of plates	Wrapping box setup	Stack	No of +Ve , -Ve Plates& Separator thickness	Annexure I	Visual Inspection	1	Setup Approval before starting of work and every hr of run time	Supervisor/operator		Reject the damaged ones, repalce with new ones.Two separators are placed around positive plates.		
Group Burning		Group	Group Height from bottom to terminal Top	353.5 ± 2 mm for 200Ah - 600Ah and 469 ± 2 mm for 600Ah Y -1500Ah,293.5 ± 2 mm for 6V 120Ah and 606 ± 2 mm for 650Ah	Scale /Height guage	1	Every Batch	Supervisor/operator				
			Physical / Visual appearance of busbar	Shrinkage	Not Allowed	Visual Inspection	100%	All cells	Operator	VRLA/BSPTC L/002	Rework by remelting / removal of lead etc. Reject in case of not reworkable.	
		Pin holes										
		Blow holes										
			double layers									
			Lead rundown									



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						Qty/Nos	Frequency	Person Responsible Production/QC		Prod.	
Containerisation	Containerising Machine	Appearance	Visual Defects	No damages on separator, plates & container	Visual Inspection	1	Every Hour	Supervisor/operator	-----		
Heat Sealing	Heat sealing Machine	Height of cell up to lid	Heater plate temperature	260 ± 10°C for Line 1 to Line 3, 320 ± 20°C for Line 4 & 5, 290 ± 20°C for Line 6 (Melting time for Line 6 is 8 ± 3 secs)	Digital Panel Meter	1	Set up Approval & Every Shift	Supervisor/ operator	VRLA/BSPTCL/002	Rework the cell by changing container and lid.	
			Melting time	13 ± 5 Sec							
			Solidification time	15 ± 3 Sec							
			Height	347.5 ± 5 mm for 200Ah-600Ah and 459 ± 5 mm for 600 Ah Y - 1500Ah, 300 ± 3 mm for 6V 120Ah and 615 ± 3 mm for 650 Ah	Height Gauge	1	Visual				
Terminal Assembly	Torque wrench	Assembled Sealing/ Terminal Washer & Terminal Nut	Torque	M10: 11-12 Nm	Torque wrench	100%	Set up Approval & Every Shift	Operator	-----	Rework the cell by changing components or container & lid.	
Leak Testing	Leak Testing Machine	Leak Test	Pressure	10 PSI Min	Hydrostatic Pressure Test/Pressure Gauge	100%	Set up Approval & Every Shift	Operator	VRLA/BSPTCL/002	Rework the cell by changing container & lid.	
			No bubbling from Sealing & Terminals	Not Allowed	Visual Inspection						
			Immersion time	30 sec for 200Ah-600Ah,6V 120Ah & 50 sec for 600Ah Y - 1500Ah	Inbuilt						
Epoxy Filling	Manual mix & manual pouring	Epoxy	Terminal cleaning	No dust / Oils /water on terminals	Visual	100%	Every Shift	Operator	VRLA/BSPTCL/002	If not meeting the requirement reject the cell and send for rework after informing to concerned authorities	
			Hardner & Resin	1:2	Visual						
			Qty of Epoxy	Fill completely	Manual pouring						
			Level of Epoxy	Shall be equal to lid cavity top	Visual						
			Visual appearance after Drying	Should have smooth & dry hard surface. No bubbles	Visual						
Drying Time	Min 3 Hrs	Visual									
Electrolyte preparation	Dilution Plant	Diluted Sulphuric Acid	Specific Gravity at 27 °C	1) 1.255 ± 0.005 & 2) 1.270 ± 0.005	Hydrometer	Every Batch	Every preparation	Supervisor/operator	Recorded in Register	Add acid / DI water based on specific gravity of electrolyte after informing to DM plant Incharge	
			Impurities	Fe <10ppm & Cl < 5 ppm	Wet Analysis						
Electrolyte Filling	Filling Machine	Filling Acid	Temperature at the time of filling into the cell	< 5 °C	Thermometer	Once	Every Shift	Supervisor/operator	Recorded in Register	Wait till the required temperature is achieved	
		Diluted Sulphuric Acid	Filling Qty	Annexure-I	Weighing Machine	100%					
Jar Formation	Chargers & Discharger	Formed Cells	Soaking time	1.5 Hrs	Clock	100%	Every batch	Operator	VRLA/BSPTCL/002		
			Water bath temperature	30 ± 5 °C	Temp. Indicator / Thermometer						
			Formation regime	Annexure-I	Charger cum Discharger						
			Cell cleaning	Acid traces/dust/visual defects Not Allowed	Visual	100%	Every Cell	Operator	-----	Get the cells cleaned	
	Vent plug		Vent plug tightening	100 % inspected vent plugs should be tightened to the cells and sent to dispatch section	Vent Plug tightener	100%	Every Cell	Operator	-----	Fasten the vent plug	



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Vent Plug Testing	Testing jig		Pressure of opening	3-5 PSI	Digital gauge / 0.001PSI	-	Every One	Supervisor/ Operator	Recorded in Register	Reject the vent plug if doesn't meet the requirement Dispatch	
Battery Assembly and Final Inspection			OCV after 7 days storage	≥ 2.14	Multimeter	100%	Every Offering	Supervisor / Operator	VRLA/BSPTC L/002	Dispatch Instructions/Clearance of BSPTCL Reject and Inform to QC and QA Incharge	
			Terminal sulphation	Not Allowed	Visual						
			Vent plug tightening	Upto 6 NM	Visual						
			Potential Leak	< 1V	Multimeter						
			Polarity	----							
			Weld joints	Weld joints of stack box should be clean free from lumps. There shall be no gaps in the joints.	Visual	100%	Every Offering	Supervisor / Operator	VRLA/BSPTC L/002	Dispatch Instructions/Clearance of BSPTCL Cell matching should be done as per the specified values (BSNL)	
			Grouping	Cells shall be grouped as per the procedure	Visual						
			Voltage matching	The difference between the highest and lowest open circuit voltage in the battery cell module & string should be < 0.1V in series matching and <0.02V in parallel matching in battery string							
			Battery Assembly	As Per appropriate General Arrangement Drawing							
			Marking	As per General Arrangement Drawing and Packing method							Dispatch Instructions/Clearance of BSPTCL
			Screen Printing	As per General Arrangement Drawing							Dispatch Instructions/Clearance of BSPTCL Screen Printing and Marking should be as per the Drawing provided
			Battery Testing								
			Verification of dimensions		IS 1651/BSPTCL specs	Electrical Tests	IS 1651	Every Offering	Supervisor	Test Record	Dispatch Instructions/ Clearance of BSPTCL
Test for capacity		IS 1651/BSPTCL specs	Electrical Tests	IS 1651	Every Offering	Supervisor	Test Record	Dispatch Instructions/ Clearance of BSPTCL			
Test for voltages during discharge		IS 1651/BSPTCL specs	Electrical Tests	IS 1651	Every Offering	Supervisor	Test Record	Dispatch Instructions/ Clearance of BSPTCL			
Packing & Dispatch		Set Packing	Accessories	As per General Arrangement Drawing	Visual	100%	Every Set	Supervisor / Operator	VRLA/BSPTC L/002	Make sure all the accessories are in place	
			Storage of packed batteries	Should be stored in shade / rain proof or covered with water proof covers.						Make sure all the batteries are stored in dry and cool place. Packing to be done as per the customers requirement	