

BHARAT HEAVY ELECTRICALS LIMITED ; BHOPAL
QUALITY PLAN FOR GLUED PAPER INSULATED COPPER CONDUCTOR (GPICC)
QA PLAN NO. : QA/TCB/BO/74 REV. 00 DT. : 07.03.2003

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SL	COMPONENT/ ASSEMBLY/ OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT & ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY	REMARKS
1.0	RAW MATERIAL INSPECTION							
1.1	ELECTROLYTIC TOUGH PITCH CONTINUOUSLY CAST COPPER WIRE	CHEMICAL COMPOSITION (1) COPPER INCLUDING SILVER (2) OXYGEN CONTENT (3) DIMENSIONS	T M	ONE SAMPLE PER LOT -DO-	BHEL SPEC. AA 12024/ ASTM B-49 -DO-	TC TR	SUPPLIER SUPPLIER	TC REVIEW
1.2	GLUED PAPER STRIP	THICKNESS,WIDTH MASS/AREA,ADHESIVE CONTENT, VOLATILE CONTENT,BDV, SHEARING STRENGTH , TENSION AT 20°C , DATE OF MANUFACTURE, DATE OF EXPIRY	V,M	100%	BHEL SPEC TRE 151	TC	SUPPLIER	TC AS SUBMITTED BY GLUED PAPER STRIP MANUFACTURER SHALL BE REVIEWED BY PICC MFR. TC TO BE SUBMITTED TO BHEL ALONGWITH SUPPLY.
1.3	ENAMELS	COLOUR, APPEARANCE, SOLID CONTENTS, VISCOSITY, DATE OF MANUFACTURE , DATE OF EXPIRY	V	100%	PVA ENAMEL CLASS 120°C	TC	SUPPLIER	TC TO BE SUBMITTED FOR BHEL ACCEPTANCE BEFORE START OF MANUFACTURING
1.4	KRAFT INSULATING PAPER	(A) THICKNESS	M	ONE SAMPLE PER THICKNESS PER LOT	BHEL SPEC. AA 21111	TC OR TR	SUPPLIER	TC AS SUBMITTED BY PAPER MANUFACTURER (BHEL BHOPAL APPROVED) SHALL BE REVIEWED BY PICC MFR. TC TO BE SUBMITTED FOR BHEL ACCEPTANCE BEFORE COVERING.

		(B) SUBSTANCE, DENSITY, MOSITURE CONTENT WATER ABSORPTION IN MACHINE /CROSS MACHINE DIRECTION, AIR PERMEABILITY, TENSILE INDEX, TEAR INDEX, ELECTRICAL STRENGTH IN AIR, ASH CONTENT, CONDUCTIVITY OF 5% AQUEOUS EXTRACT, pH OF 5% AQUEOUS EXTRACT	T	ONE SAMPLE PER THICKNESS PER LOT	BHEL SPEC. AA 21111 / BHEL PO	TC OR TR	SUPPLIER	TC AS SUBMITTED BY PAPER MANUFACTURER (BHEL BHOPAL APPROVED) SHALL BE REVIEWED BY PICC MFR. TC TO BE SUBMITTED FOR BHEL ACCEPTANCE BEFORE COVERING.
		(C) HEAT STABILITY, DECREASE IN BURSTING STRENGTH, INCREASE IN CONDUCTIVITY OF AQUEOUS EXTRACT (TYPE TEST)	T	-DO-	-DO-	-DO-	-DO-	
1.5	PVA BASED ADHESIVE USED FOR KRAFT PAPER BONDING (ACNHORING THE ENDS OF PAPER)	A) TYPE , GRADE & MAKE	V	100%	IS 2257 / IEC	-DO-	-DO-	
		B) NON VOLATILE MATTER CONTENT, CONSISTENCY , BOND STRENGTH, pH VALUE ,COMPATIBILITY WITH OIL (TYPE TEST)	T	100%	-DO-	-DO-	-DO-	
1.6	PACKING DRUM	TYPE, SIZE DIMENSION, FINISH, VISUAL CHECK FOR QUALITY OF WOOD , MATERIAL USED FOR FLANGE AND BARREL.	V,M	SAMPLE	BHEL SPEC. AA28125, AA28128, IS 2069	TC/TR	SUPPLIER	

2.0	INPROCESS CHECKS AND INSPECTION						
2.1	POLISHING / REPLACEMENT OF ROLLERS, DIES, EDGERS	A) FLATTENING ROLLERS B) EDGE ROLLERS, SHAVING DIES AND DRAWING DIES					FOR SL. 2.1 TO 2.5 PICC MANUFACTURER TO SPECIFY THE CHECKS, RECORDS, REF. DOCS. ETC. AS PER THEIR PROCESS OF MANUFACTURE
2.2	SHAVING	REDUCTION IN CROSS SECTION BY SHAVING, SIZE OF DIE USED					- DO -
2.3	DRAWING	NO. OF PASSES, CHECK FOR FINAL DIA. OF ROD BEFORE FLATTENING					- DO -
2.4	FLATTENING	A) NO. OF PASSES, CLEANING OF STRIP BY MECHANICAL MEANS OR ELECTRO-CHEMICAL PROCESS OR ANY OTHER SUITABLE PROCESS. B) THICKNESS, WIDTH, CORNER RADIUS, MERGING OF RADIUS WITH SIDES, SQUARENESS OF EDGES OF FINISHED CONDUCTOR SURFACE FINISH.					- DO -
2.5	ANNEALING	A) SOAKING TEMP. & TIME, COOLING TIME, VACUUM LEVEL, PURITY AND MOISTURE CONTENT OF NITROGEN GAS (IF USED) B) PROOF STRESS					- DO -

2.6	ENAMELLING OF COPPER CONDUCTOR	A) INCREASE IN DIMENSIONS DUE TO ENAMELLING & SURFACE FINISH OF ENAMEL COVERING	M	ONE CHECK FOR EACH SETTING OF ENAMELLING PROCESS OR ONE CHECK FOR EACH MOTHER REEL.	AA28125/ AA28128/ TRE 078/ IS 13730 PART 0 SEC. 2 1993/ IS 13730 PART 18 IEC 6 0317 0-2 & IEC 317-18	TR	SUPPLIER	TC TO BE SUBMITTED FOR BHEL APPROVAL BEFORE START OF WINDING
		B) MANDREL WINDING TEST, ADHERENCE (STRETCHING TEST), BDV, HEAT SHOCK, SOLVENT TEST	T	-DO-	-DO-	-DO-	-DO-	-DO-
		C) JOINTS OF GLUED STRIP	V	100%	SHALL BE OVERLAPPED BY 100mm & SEALED USING ADHESIVE TAPE	TR	-DO-	RECORDS TO BE KEPT FOR REVIEW DURING FINAL INSPECTION BY BHEL
2.7	SLIT KRAFT PAPER STORAGE ROOM, PAPER COVERING SLITTING AREA.	SEPARATE ENCLOSURE / ROOM TO BE AVAILABLE. CLEANILINESS	V	CLEANLINE SS TO BE CHECKED	-	TR	-DO-	
2.8	GLUED PAPER STRIP STORAGE	MONITORING OF TEMPERATURE, SHELF LIFE, EXPIRY DATE, DATE OF MANUFACTURE	V	100%	GLUED PAPER TO BE STORED AT LESS THAN 10°C	TR	-DO-	RECORD TO BE FURNISHED ALONGWITH SUPPLY.
2.9	KRAFT PAPER SLITTING	A) WIDTH OF SLIT PAPER	T	ONE SAMPLE PER SETTING	+ - 1 mm OF NOMINAL VALUE	-DO-	-DO-	
		B) PROPER LABELLING OF SLIT ROLLS, THICKNESS & WIDTH	V	100%	MAINTENANCE OF RECORD	-DO-	-DO-	

2.1 0	PAPER COVERING OPERATION	A) CHECKING OF TOTAL LENGTH OF CONDUCTOR FOR ACCEPTABLE SURFACE FINISH AND BRIGHTNESS OF STRIP	V	100%	SMOOTH FINISH WITHOUT ANY CHATTERING, EDGE, CRACK, LINE, CUT, BURR, BLISTER, SCRATCH/DENT.	TR	SUPPLIER	RECORDS TO BE KEPT FOR REVIEW DURING FINAL INSPECTION BY BHEL
		B) NUMBER OF FELT PADS. WIDTH OF PADS FREQUENCY FOR REPLACEMENT OF PADS	V,M	100%	COPPER & FOREIGN DUST PARTICLES/ STRIP TO BE UNTARNISHED. AA28125/ AA28128 MAINTENANCE OF RECORD FOR EACH BARREL. MAINTENANCE OF RECORD FOR ALL PARAMETERS OF CHARACTERISTIC S COLUMN.	TR	SUPPLIER	RECORDS TO BE KEPT FOR REVIEW DURING FINAL INSPECTION BY BHEL
3.0	FINAL INSPECTION	A) NUMBER OF PAPER LAYERS, THICKNESS OF PAPER IN LAYERS, WIDTH OF PAPER.	V,M		SAMPLE CHECK FOR EACH MOTHER REEL./ ONE CHECK FOR EACH SETTING OF PAPER COVERING WHICHEVE R COMES EARLIER.	TR	SUPPLIER & BHEL	BHEL QC CHP (ON SAMPLE BASIS)

		B) INCREASE IN DIMENSIONS DUE TO PAPER COVERING BY DIFFERENCE METHOD AND BY INDIVIDUAL PAPER THICKNESS METHOD	M	SAMPLE CHECK FOR EACH MOTHER REEL/ ONE CHECK FOR EACH SETTING OF PAPER COVERING WHICHEVER COMES EARLIER.	AA28125/ AA28128/ BHEL PO/ TRE 078	TR	SUPPLIER & BHEL	BHEL QC CHP (ON SAMPLE BASIS)
		C) COVERED THICKNESS	M	-DO-	-DO-	-DO-	-DO-	BHEL QC CHP (ON SAMPLE BASIS)
		D) JOINTS OF GLUED STRIP	V	100%	SHALL BE OVERLAPPED BY 100mm & SEALED USING ADHESIVE TAPE	TR	-DO-	BHEL QC CHP FOR REVIEW OF INPROCESS RECORDS
		E) INCREASE IN DIMENSIONS DUE TO ENAMELLING & SURFACE FINISH OF ENAMEL COVERING	M	AS AT B) ABOVE	AS AT B) ABOVE	TR	-DO-	BHEL QC CHP (ON SAMPLE BASIS)
4.0	FINAL TESTS	A) PROOF STRESS	T	100% (ONE SAMPLE FROM EACH REEL)	AA28128 / TRE 078 / TRE 151 / AA28125	TR	-DO-	BHEL QC CHP (ON SAMPLE BASIS)
		B) ELECTRICAL RESISTIVITY	T	SAMPLE LOT SIZE UPTO 50 = 3 51-300 = 9	AA28128 / TRE 078 / TRE 151 / AA28125	TR	SUPPLIER & BHEL	BHEL QC CHP (ON SAMPLE BASIS)
		C) INSULATION TEST AND RECORDING OF CHARGING CURRENT AT 250 V	T	100% (ON EACH DRUM)	-DO-	TR	-DO-	BHEL QC CHP (ON SAMPLE BASIS)
		D) ISOLATION TEST BETWEEN STRANDS OF DRUM AT 2 KV FOR ATLEAST 2 SECONDS	-DO-	-DO-	-DO-	-DO-	-DO-	BHEL QC CHP (ON SAMPLE BASIS)

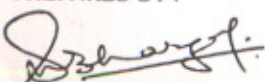
		E) BUCKLING LOAD	T	SAMPLE LOT SIZE UPTO 50 = 3 51-300 = 9	-DO-	TR	-DO-	BHEL QC CHP (ON SAMPLE BASIS)
		F) MANDREL WINDING TEST, ADHERENCE (STRETCHING TEST), BDV, HEAT SHOCK, SOLVENT TEST	T	-DO-	-DO-	-DO-	-DO-	BHEL QC CHP (ON SAMPLE BASIS)
5.0	PACKING & DESPATCH	PROVISION OF INTER LAYER PAPER FOR CROSS SECTION EXCEEDING 40 sq. mm. USE OF 580 mm BARREL DRUMS FOR BUNCHES AND PROOF STRESS PICC, ABSENCE OF GAP BETWEEN ADJACENT TURNS ON DRUM.	V	100% ON EACH DRUM)	-DO-	-DO-	-DO-	
5.1	PACKING	AVAILABILITY OF 25 mm MIN. GAP BETWEEN FULLY PACKED CONDUCTOR AND DRUM FLANGE DIAMETER, STAMPING/SEALING OF CONDUCTOR END & DRUMS BENDING STRIPS.						
5.2	MARKING	PROPER MARKING ON DRUMS INCLUDING DATE OF MANUFACTURING & UNIQUE IDENTIFICATION NUMBER.	V	-DO-	-DO-	-DO-	-DO-	

V - VISUAL
M - MEASUREMENT
T - TEST

SPEC. - SPECIFICATION

TC - TEST CERTIFICATE / REPORT ISSUED BY MFR. OF ITEMS TO PICC MFR.
TR - TEST CERTIFICATE / REPORT / QC RECORD/ MFG. RECORD OF PICC MFR.
BHEL QC - BHEL QUALITY CONTROL CHP - CUSTOMER HOLD POINT OF BHEL QC

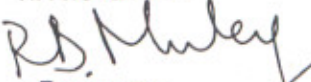
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