



**MANUFACTURER'S NAME AND ADDRESS**  
Component Fabrication Plant(CFP), RUDRAPUR

**MANUFACTURING QUALITY PLAN**

Item: AC Cable  
QP No: QP/SOLAR/AC CABLE/NU-02  
Rev No: 03  
Date: 28.10.2021  
Page: 01 of 05

**Customer**

HALANDA UNIVERSITY, RAJGIR-BIHAR,  
Project : 6.5 MWp(DC)/5 MW (AC) GRID CONNECTED GROUND MOUNTED SOLAR POWER PLANT  
Contract No : 8932 DATED 02.03.2021

Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of Check	Reference Document	Acceptance Norms/ Standard	Format of Records	Agency			Remarks
									M	C	B	
1	2	3	4	5	6	7	8	9	10			11
Instructions: 1) Cable manufacturer to maintain records to show co-relation of raw materials to finished cables i.e. raw material batch/ lot no. should be traceable to the drum/roll number. 2) Cable manufacturer to maintain all quality control records identified as per all QP stages enumerated below whether it is identified for BHEL verification / witness or not.												
<b>1.0 Raw material</b>												
1.1	Conductor Copper	Surface finish	B	Visual	Every Receipt	RM-01/CU	RM-01/CU	Supplier T.C.	R			
		Diameter	C	Physical	- do -	- do -	- do -	- do -	R			
		Elongation	C	Physical	- do -	- do -	- do -	- do -	R			
		Resistivity	C	Electrical	- do -	- do -	- do -	- do -	R			
		Purity	C	Chemical	- do -	- do -	- do -	- do -	R			
1.2	Aluminium Ingots	Surface finish	B	Visual	Every Receipt	RM-01/AL	RM-01/AL	Supplier T.C.	R			
		Hardness	A	physical	- do -	- do -	- do -	- do -	R			
		Purity	A	Chemical	- do -	- do -	- do -	- do -	R			
<b>2</b>												
2.1	INSULATION COMPOUND	Physical Appearance	A	Visual	Every Lot	Should be free from foreign Particles	RM-02/01 & RM-02/08	Supplier TC	R			
	PVC COMPOUND	Density / Specific Gravity	B	Physical	- do -	Plant Std	- do -	- do -	R			
		Tensile strength & Elongation	C	Mechanical	- do -	IS 10810 Part 7	- do -	- do -	R			
		Thermal Stability	C	Physical	- do -	IS 10810 Part 60	- do -	- do -	R			
		Volume Resistivity	C	Electrical	- do -	IS 10810 Part 43	- do -	- do -	R			
2.2	XLPE	Tensile strength & Elongation	C	Mechanical	- do -	IS 10810 Part 7	RM-04/01	Supplier TC	R			
		Hot set test & Permanent set	C	Physical	- do -	IS 10810 Part 30	- do -	- do -	R			
		Volume Resistivity	C	Electrical	- do -	IS 10810 Part 43	- do -	- do -	R			
<b>3 SHEATHING COMPOUND</b>												
3.1	PVC COMPOUND	Physical Appearance	A	Visual	Every Lot	Should be free from foreign Particles	RM-02/16 to RM-02/26	Supplier TC	R			
		Density / Specific Gravity	B	physical	- do -	Plant Std	- do -	- do -	R			
		Tensile strength & Elongation	C	Mechanical	- do -	IS 10810 Part 7	- do -	- do -	R			
		Thermal Stability	C	Physical	- do -	IS 10810 Part 60	- do -	- do -	R			
		Smoke Density	C	Fire	- do -	ASTM D 2843	- do -	- do -	R			For FRLS compound on
		Oxygen Index	C	Fire	- do -	ASTM D 2893	- do -	- do -	R			For FR/FRLS compound on
		Halogen Acid Gas	C	Chemical	- do -	IEC 754-1	- do -	- do -	R			For FRI-D compound on

LEGEND : M : Manufacturer, C : Customer/Client, P : Perform, W : Witness, R : Review Of supplier's T.C.A : Minor, B : Major, C : Critical

  
 राजेश बाहु  
 इंजीनियर (रजनीश एनर्जी ग्रुप)  
 बी.एस.ई.एल., रुद्रपुर  
 263153  
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Sl. No		Component & Operations	Characteristics	Class	Type of check	Quantum of Check	Reference Document	Acceptance Norms/ Standard	Format of Records	Agency			Remarks
1		2	3	4	5	6	7	8	9	M	C	B	11
		<b>MANUFACTURER'S NAME AND ADDRESS</b>		<b>MANUFACTURING QUALITY PLAN</b>			<b>Customer</b>						
		Component Fabrication Plant(CFP) ,RUDRAPUR		Item: AC Cable			Project		: NALANDA UNIVERSITY, RAJGIR-BIHAR				
				OP No: GP/SOLAR/AC CABLE/NU-02			Contract No		: 6.5 MWp(DC)/5 MW (AC) GRID CONNECTED GROUND MOUNTED SOLAR POWER PLANT				
				Rev No: 00					: 9922 DATED 02.03.2021				
				Date: 28.10.2021									
				Page: 01 Of 05									
4		ARMOUR	Surface Condition	A	Visual	Every Lot	Should be free from white spots, oxidation	RM-07/01 to 17	Supplier TC				
			Dimensions	C	Measrt	- do -	IS 10810 Part 36	- do -	- do -	R			
			Tensile strength & Elongation	A	Mechanical	- do -	IS 10810 Part 37	- do -	- do -	R			
			Torsion Test for Round wires	A	Mechanical	- do -	IS 10810 Part 38	- do -	- do -	R			
			Uniformity of zinc coating (Dipping Test)	C	Chemical	- do -	IS 10810 Part 40	- do -	- do -	R			
			Mass Of Zinc coating	C	Chemical	- do -	IS 10810 Part 41	- do -	- do -	R			
			Electrical Resistivity	C	electrical	- do -	IS 10810 Part 42	-do-	- do -	R			
5		COPPER CONDUCTOR	No. Of Strands	C	Count	100%	Counting	QA/QMS/PS,'01 to 16	Supplier TC				
			Strand/Conductor Diameter	C	Measrt	- do -	- do -	- do -	- do -	R			
			Resistance	C	Electrical	- do -	- do -	-do-	- do -	R			
			Conductor Material	C	Visual	- do -	- do -	- do -	- do -	R			
			Laylength and Lay Direction	C	Measrt	- do -	- do -	- do -	- do -	R			Expect Solid Conductors
			Surface Finish	C	Visual	- do -	Should be smooth & free from scratches	Should be smooth & free from scratches	- do -	R			
6		WOODEN DRUMS	Flange diameter	B	Measrt	Every Lot	Internal Checklist	RM-09A,'01	Check Sheet	R			
			Flange Thickness	B	Measrt	-do-	- do -	- do -	- do -	R			
			Barrel diameter	D	Measrt	- do -	- do -	- do -	- do -	R			
			Center hole diameter	B	Measrt	- do -	- do -	- do -	- do -	R			
			No. Of pieces in flange	B	Count	- do -	Counting	- do -	- do -	R			
			No. of Tie rods	B	Measrt	- do -	- do -	- do -	- do -	R			
			Tie rod diameter	B	Measrt	- do -	Plant Std	- do -	- do -	R			
			Visual checks	B	Visual	- do -	Should be free from Cracks rate Nails ro ecton, Paint	- do -	- do -	R			
			Hub Plate thickness	B	Measrt	- do -	Plant Std	- do -	- do -	R			
II		PROCESS INSPECTION											
7		Rolling Mill	Diameter	C	physical	10% of Produced	Plant Standard	Manufacturing Design Sheet	inprocess Report for Rollin Mill	P			
			Resistivity and Conductivity	C	Electrical	- do -	- do -	- do -	- do -	P			
			Tensile Strength	C	Mechanical	- do -	-do-	-do-	- do -	P			
			Surface Finish	B	Visual	- do -	-do-	- do -	- do -	P			

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Engineer (Renewable Energy Group)  
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MANUFACTURER'S NAME AND ADDRESS  
Component Fabrication Plant(CFP),RUDRAPUR

MANUFACTURING QUALITY PLAN  
QP No: QP/SOLAR/AC CABLE/NU-02  
Rev No: 00  
Date: 28.10.2021  
Page: 01 OF 05

Customer : NALANDA UNIVERSITY, RAJGIR-BIHAR  
Project : 6.5 MWp(DC)/5 MW (AC) GRID CONNECTED GROUND MOUNTED SOLAR POWER PLANT  
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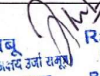
Sl. No	Component & Operations	Characteristics	Class	Type of check	Quantum of Check		Reference Document	Acceptance Norms/ Standard	Format of Records	Agency			Remarks
					M	7				M	C	B	
1	2	3	4	5	6	7	8	9	10			11	
8	ROD BREAKDOWN	Diameter	C	physical	10% of Produced		Plant Standard	Manufacturing Design Sheet	Inprocess Report for ROD	P			
		Resistance	C	Electrical	- do -		- do -	- do -	- do -	P			
		Annealing Test Copper	C	Physical	- do -		- do -	- do -	- do -	P			
9	Conductor Stranding & Bunching	Surface Finish	B	Visual	- do -		- do -	- do -	- do -	P			
		No. of Wires / Diameter of wires.	C	Count	10% of Produced		IS 1554-1 / IS 7098-1 / IEC 60502-1	Manufacturing Design Sheet	Inprocess Report for Conductor	P			
		Lay Length	B	Physical	- do -		- do -	- do -	- do -	P			
		C.R.	C	Electrical	- do -		- do -	- do -	- do -	P			
		Diameter of conductor.	C	Physical	- do -		- do -	- do -	- do -	P			
		Surface Finish	B	Visual	- do -		- do -	- do -	- do -	P			
		Conductor Material	B	Physical	- do -		- do -	- do -	- do -	P			
10	INSULATION	Type of Insulation compound	B	Visual	10% of Produced		IS 1554-1 / IS 7098-1 / IEC 60502-1	Manufacturing Design Sheet	Inprocess Report for Insulation	P			
		Dia. Over conductor	A	Measrt	- do -		- do -	- do -	- do -	P			
		Dia. Over core	A	Measrt	- do -		- do -	- do -	- do -	P			
		Thickness of Insulation	C	Measrt	- do -		- do -	- do -	- do -	P			
		Spark Testine - Online	C	Electrical	100%		- do -	- do -	- do -	P			
		Surface finish	A	Visual	10% Of Produced		- do -	- do -	- do -	P			
		Colour	A	Visual	- do -		- do -	- do -	- do -	P			
11	LAYING-UP	Core Sequence	B	Visual	10% Of Produced		IS 1554-1 / IS 7098-1 / IEC 60502-1	Manufacturing Design Sheet	Inprocess Report for Lay n	P			
		Lay Length & Lay Direction	A	Measrt	- do -		- do -	- do -	- do -	P			
		Diameter Over Laidup	A	Measrt	- do -		- do -	- do -	- do -	P			
12	INNER SHEATH	Inner Sheath Material	C	Visual	10% of Produced		IS 1554-1 / IS 7098-1 / IEC 60502-1	Manufacturing Design Sheet	Inprocess Report for Inner Sheath	P			
		Diameter Below Inner Sheath	B	Measrt	- do -		- do -	- do -	- do -	P			
		Diameter over Inner Sheath	B	Measrt	- do -		- do -	- do -	- do -	P			
		Thickness Of Innersheath	C	Measrt	- do -		- do -	- do -	- do -	P			
		Colour	R	Visual	- do -		- do -	- do -	- do -	P			
Surface Finish	A	Visual	- do -		- do -	- do -	- do -	P					

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Sl. No		Component & Operations		Characteristics		Class		Type of check		MANUFACTURING QUALITY PLAN		Customer		Agency		Remarks
										Item: AC Cable	QP No: OP/SOLAR/AC CABLE/NU-02 Rev No: 00 Date: 28.10.2021 Page: 01 of 05	Reference Document	Acceptance Norms/ Standard	Format of Records	M	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		<b>MANUFACTURER'S NAME AND ADDRESS</b> Component Fabrication Plant(CFP) ,RUDRAPUR										: NALANDA UNIVERSITY, RAJSHI-BIHAR. : 6.5 MWp(DC)/5 MW (AC) GRID CONNECTED GROUND MOUNTED SOLAR POWER PLANT : 8932 DATED 02.03.2021				
13	ARMOURING (As Applicable)	No of Wires Wire Size Laylength & Lay Direction Diameter Below armour Diameter over armour Coverage	B C A A A C	Count Measrt Measrt Measrt physical Measrt	10% Of Produced - do - - do - - do - - do - -do-	IS 1554-1 / IS 7098-1 / IEC 60502-1 - do - - do - - do - - do - -do-	Manufacturing Design Sheet	Inprocess Report for Armourin	p							
14	OUTER SHEATH	Type of compound Diameter Below Outer Sheath Dia. Over outer sheath Thickness Colour & Surface finish Embossing / Printing Sequential Marking Spark Testing for Armour cables	C B A C A C C C	Physical Measrt Meast Measrt Visual Visual -do- Electrical	10% Of Produced -do- -do- -do- -do- -do- -do- -do-	IS 1554-1 / IS 7098-1 / IEC 60502-1 - do - - do - - do - - do - - do - - do - - do - BS 5099	Manufacturing Design Sheet	Inprocess Report for Outer Sheath	p							
III Finished Goods Inspection																
15	ROUTINE TESTS	High Voltage Test Conductor Resistance	C C	Electrical Electrical	100% -do-	IS 10810 Part45 IS 10810 Part 5	IS 1554-1 / IS 7098-1 / EC 60502-1 IS 8130 / EC 60228	Routine Test Report	p							
16	ACCEPTANCE TESTS	High Voltage Test Conductor Resistance Volume Resistivity at Room Tem erature Volume Resistivity at Rated Tem erature Tensile Strength and Elongation test on Insulation Tensile Strength and Elongation test on Sheath Hotset and Permanent set XLPE Material Thickness of Insulation and Sheath Construction and Dimensions Visual Check	B B B C B C B B A	Physical Physical Electrical Electrical Mechanical Mechanical Physical Measrt Measrt Visual	IS 1554-1 / IS 7098-1 / IEC 60502-1 -do- -do- -do- -do- -do- -do- -do- -do- -do- -do-	IS 10810 Part45 IS 10810 Part 5 IS 10810 Part 43 IS 10810 Part 43 IS 10810 Part 7 IS 10810 Part 7 IS 10810 Part 30 IS 10810 Part 6 IS 10810 Part 6 Plant Standard	IS 1554-1 / IS 7098-11 EC 60502-1 IS 8130 / EC 60228 IS 1554-1 / IS 7098-1 / EC 60502-1 -do- -do- -do- IS 7098-1 / EC 60502-1 IS 1554-1 / IS 7098-1 / EC 60502-1 -do- -do-	Acceptance Test Report	p							

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**राजेश बाबू**  
 3/11/2021 (अभियंता राजेश बाबू)  
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Component Fabrication Plant(CFP),RUDRAPUR

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Item: AC Cable  
QP No: QP/SOLAR/AC CABLE/NU-02  
Rev No: 00  
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**Customer Project**  
Contract No  
: NALANDA UNIVERSITY, RAJGIR-BIHAR.  
: 6.5 MWp(DC)/5 MW (AC) GRID CONNECTED GROUND MOUNTED SOLAR POWER PLANT  
: 8932 DATED 02.03.2021

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					M				M	C	B	
1	2	3	4	5	6	7	8	9	10	11	12	
17	FRI-SFR Tests on Outer sheath (As Applicable)	Oxygen Index Test	C	Fire	- do -	ASTM D 2863	- do -	- do -	P	w	w	For FR / FRLS only
		Temperature Index	C	Fire	- do -	- do -	- do -	- do -	P	w	w	For FR / FRLS Only
		Flame Retardant Test on Single cable	C	Fire	- do -	IEC 60332-1 / IS 10810 Part 53	- do -	-do-	P	w	w	
		Smoke Density	C	Fire	- do -	ASTM D 2843	- do -	-do-	P	w	w	For FRI-S only
		HCL Gas Emission	C	Chemical	- do -	IEC 60754- 1	- do -	-do-	P	w	w	For FRI-S only
		Swedish Chimney	C	Fire	- do -	IS 10810 Part	- do -	-do-	P	w	w	For FR / FRI-S only
18	TYPE TEST	Properties in the state as manufactured	B	physical	One sample / Type / PO							
a	Tests on Conductor (As Applicable)	Conductor Resistance	C	Electrical	- do -	IS 10810 Part 5	IS 1554 - 1 IIS 7098-1/ IEC 60502-1	Type Test Report	P	R	R	
		Conductor elongation at break	C	Electrical	- do -	IS 10810 Part 1	- do -	- do -	P	R	R	
b	Tests for Armouring wire/Strip (As Applicable)	Dimensions	B	Measur	- do -	IS 10810 Part 36	IS 1554 - 1 IS 7098-1/ IEC 60502-1	- do -	P	R	R	
		Tensile Strength & Elongation	B	Mechanical	- do -	IS 10810 Part 37	- do -	- do -	P	R	R	
		Torsion on round Wres	B	Mechanical	- do -	IS 10810 Part 38	- do -	- do -	P	R	R	
		Wrapping test	B	physical	- do -	IS 10810 Part 39	- do -	- do -	P	R	R	
		Electrical Resistivity	B	Electrical	- do -	IS 10810 Part 42	- do -	- do -	P	R	R	
		Mass of Zinc coating	B	Chemical	- do -	IS 10810 Part 41	- do -	-do-	P	R	R	
		Uniformity of Zinc coating(Dipping test)	B	Chemical	- do -	IS 10810 part 40	- do -	- do -	P	R	R	
a	Test for Thickness	Insulation	C	physical	- do -	IS 10810 Part 06	IS 1554 - 1 / IS 7098-1 / IEC 60502-1	- do -	P	R	R	
		Sheath	C	physical	- do -	- do -	- do -	- do -	P	R	R	
b	Physical tests on Insulation (As Applicable)	Tensile Strength & Elongation at break	B	physical	One sample / Type / PO	IS 10810 Part 07	IS 1554 - 1 / IS 7098-1 / IEC 60502-1	- do -	P	R	R	
		Ageing test in air oven	B	physical	- do -	IS 10810 Part 11	- do -	- do -	P	R	R	
		Loss of mass in air oven	B	physical	- do -	IS 10810 Part 10	- do -	- do -	P	R	R	
		Heat Shock	B	physical	One sample / Type / PO	IS 10810 Part 14	- do -	- do -	P	R	R	
		Pressure test at high temperature	B	physical	- do -	IS 10810 Part 15	- do -	- do -	P	R	R	
		Bending test at low temperature	B	physical	- do -	IS 10810 Part 20	- do -	- do -	P	R	R	
		Impact test low temperature	B	Physical	- do -	IS 10810 Part 21	- do -	- do -	P	R	R	
		Thermal Stability	B	Thermal	- do -	IS 10810 Part 60	- do -	-do-	P	R	R	

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*[Faint signature and stamp]*

MANUFACTURER'S NAME AND ADDRESS		MANUFACTURING QUALITY PLAN				Customer						
Component Fabrication Plant(CFP),RUDRAPUR		Item: AC Cable	QP No: 00/SP/AR/AC CARI/NU/07 Rev No: 00 Date: 28.10.2021 Page: 01 Of 05		Project	NALANDA UNIVERSITY, RAJSHI-BIHAR K.S.BMW(DC)/S.MW (AC) GRID CONNECTED GROUND MOUNTED SOLAR POWER PLANT :8932 DATED 02.03.2021						
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1	2	3	4	5	6	7	8	9	10	11		
		Shrinkage	B	Physical	-do-	IS 10810 Part 12	-do-	-do-	p	R	R	
		Hot set test (For XLPE)	B	Physical	-do-	IS 10810 Part 30	-do-	-do-	p	R	R	
		Water absorption (Gravimetric)	B	Physical	-do-	IS 10810 Part 33	-do-	-do-	p	R	R	
		Volume Resistivity	C	Electrical	-do-	IS 10810 Part 43	-do-	-do-	p	R	R	
e	Physical tests on Sheath	Tensile Strength & Elongation at break	B	Physical	-do-	IS 10810 Part 07	IS 1554-1 IS 7098-11 IEC 60502-1	-do-	p	R	R	
	(As Applicable)	Ageing test in air oven	B	physical	-do-	IS 10810 Part 11	-do-	-do-	p	R	R	
		Loss of mass in air oven	B	Physical	-do-	IS 10810 Part 10	-do-	-do-	p	R	R	
		Heat shock	B	Physical	-do-	IS 10810 Part 14	-do-	-do-	p	R	R	
		Pressure test at high temperature	B	physical	-do-	IS 10810 Part 15	-do-	-do-	p	R	R	
		Bending test at low temperature	B	physical	-do-	IS 10810 Part 20	-do-	-do-	p	R	R	
		Impact test low temperature	B	physical	-do-	IS 10810 Part 21	-do-	-do-	p	R	R	
		Thermal Stability	R	physical	-do-	IS 10810 Part 60	-do-	-do-	p	R	R	
		Shrinkage	B	Physical	-do-	IS 10810 Part 12	-do-	-do-	p	R	R	
		Anti rodent and termite test	A	Chemical	-do-	Plant standard	-do-	-do-	p	R	R	
f	High Voltage test	High Voltage test at room temperature	C	Electrical	-do-	IS 10810 Part 45	-do-	-do-	p	R	R	
e	FR/FR/FFRR Tests on Outer sheath	Oxygen Index Test	C	Physical	-do-	ASTM D 2863	-do-	-do-	p	R	R	
	(As Applicable)	Temperature Index	C	Physical	-do-	ASTM D 2863	-do-	-do-	p	R	R	
		Flame Retardant Test on single cable	C	Physical	-do-	IEC 60332-1/ IS 10810 Part 53	-do-	-do-	p	R	R	
		Vertical Flame spread vertically mounted bunched Wires or cables	C	Physical	-do-	IEC 60332-3	-do-	-do-	p	R	R	
		Smoke Density	C	Physical	-do-	ASTM D 2843	-do-	-do-	p	R	R	
		HCL Gas Emission	C	Physical	-do-	IEC 60754-1	-do-	-do-	p	R	R	
		Swedish Chimney	C	Fire	-do-	IS 10810 part 61	-do-	-do-	p	W	W	For FR / FR/S only

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Note: Makes shall be as per BHEL's specification. After finalization of vendor, vendor's MQP will be submitted to the customer.

Manufacturer/ Sub-Supplier	Main Supplier	LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION ** M: MANUFACTURER/SUB-SUPPLIER, C: MAIN SUPPLIER, B: CUSTOMER P: PERFORM, W: WITNESS AND V: VERIFICATION. IR : Inspection report TC: Test Certificate, TDS : Technical Data Sheet.	For Customer Use	Doc. No:	Rev: CAT
Signature				Reviewed By	Approved By Approval Seal

  
**राजेश बाबू**  
 राजेश बाबू (अभिनेता राजेश बाबू)  
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